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WHAT IS CLAIMED IS:

1. A human interleukin-3 mutant polypeptide

Formula I:

5 Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn
1 5 10 15

Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
20 25 30

10 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Xaa Xaa Xaa
35 40 45

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
15 50 55 60

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
65 70 75

20 Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
80 85 90

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
95 100 105

25 Xaa Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
110 115 120

Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
30 125 130

NO:15]

wherein Xaa at position 17 is Ser, Lys, Gly, Asp, Met, Gln, or

35 Arg;

Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;

- Xaa at position 19 is Met, Phe, Ile, Arg, Gly, Ala, or Cys;
Xaa at position 20 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;
Xaa at position 21 is Asp, Phe, Lys, Arg, Ala, Gly, Glu, Gln,
Asn, Thr, Ser or
5 Val;
Xaa at position 22 is Glu, Trp, Pro, Ser, Ala, His, Asp, Asn,
Gln, Leu, Val or
Gly;
Xaa at position 23 is Ile, Val, Ala, Leu, Gly, Trp, Lys, Phe,
10 Leu, Ser, or Arg;
Xaa at position 24 is Ile, Gly, Val, Arg, Ser, Phe, or Leu;
Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;
Xaa at position 26 is His, Thr, Phe, Gly, Arg, Ala, or Trp;
Xaa at position 27 is Leu, Gly, Arg, Thr, Ser, or Ala;
15 Xaa at position 28 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;
Xaa at position 29 is Gln, Asn, Leu, Pro, Arg, or Val;
Xaa at position 30 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or
Lys;
Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;
20 Xaa at position 32 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;
Xaa at position 33 is Pro, Leu, Gln, Ala, Thr, or Glu;
Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Glu, Gln, Thr,
Arg, Ala, Phe,
Ile or Met;
25 Xaa at position 35 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;
Xaa at position 36 is Asp, Leu, or Val;
Xaa at position 37 is Phe, Ser, Pro, Trp, or Ile;
Xaa at position 38 is Asn, or Ala;
Xaa at position 40 is Leu, Trp, or Arg;
30 Xaa at position 41 is Asn, Cys, Arg, Leu, His, Met, or Pro;
Xaa at position 42 is Gly, Asp, Ser, Cys, Asn, Lys, Thr, Leu,
Val, Glu, Phe,
Tyr, Ile, Met or Ala;
Xaa at position 43 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys,
35 Gln, Arg, Thr,
Gly or Ser;

- Xaa at position 44 is Asp, Ser, Leu, Arg, Lys, Thr, Met, Trp,
Glu, Asn, Gln,
Ala or Pro;
- Xaa at position 45 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys,
5 Trp, Asp, Asn,
Arg, Ser, Ala, Ile, Glu or His;
- Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, Glu, Asn, Gln,
Lys, His, Ala,
Tyr, Ile, Val or Gly;
- 10 Xaa at position 47 is Ile, Gly, Val, Ser, Arg, Pro, or His;
Xaa at position 48 is Leu, Ser, Cys, Arg, Ile, His, Phe, Glu,
Lys, Thr, Ala,
Met, Val or Asn;
- Xaa at position 49 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;
- 15 Xaa at position 50 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn, Ser,
Ala, Ile, Val,
His, Phe, Met or Gln;
- Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;
Xaa at position 52 is Asn, His, Arg, Leu, Gly, Ser, or Thr;
- 20 Xaa at position 53 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser, or
Met;
Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gln, Asn,
Lys,
His, Ala or Leu;
- 25 Xaa at position 55 is Arg, Thr, Val, Ser, Leu, or Gly;
Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, Glu, Arg, His,
Thr, Ala, Tyr, Phe, Leu, Val or Lys;
- Xaa at position 57 is Asn or Gly;
Xaa at position 58 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;
- 30 Xaa at position 59 is Glu Tyr, His, Leu, Pro, or Arg;
Xaa at position 60 is Ala, Ser, Pro, Tyr, Asn, or Thr;
Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;
Xaa at position 62 is Asn His, Val, Arg, Pro, Thr, Asp, or Ile;
Xaa at position 63 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;
- 35 Xaa at position 64 is Ala, Asn, Pro, Ser, or Lys;
Xaa at position 65 is Val, Thr, Pro, His, Leu, Phe, or Ser;

- Xaa at position 66 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
Xaa at position 67 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or His;
Xaa at position 68 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;
5 Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or Leu;
Xaa at position 70 is Asn, Leu, Val, Trp, Pro, or Ala;
Xaa at position 71 is Ala, Met, Leu, Pro, Arg, Glu, Thr, Gln, Trp, or Asn;
10 Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;
Xaa at position 74 is Ile, Met, Thr, Pro, Arg, Gly, Ala;
Xaa at position 75 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser, Gln, or Leu;
15 Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or Asp;
Xaa at position 77 is Ile, Ser, Arg, Thr, or Leu;
Xaa at position 78 is Leu, Ala, Ser, Glu, Phe, Gly, or Arg;
Xaa at position 79 is Lys, Thr, Asn, Met, Arg, Ile, Gly, or Asp;
20 Xaa at position 80 is Asn, Trp, Val, Gly, Thr, Leu, Glu, or Arg;
Xaa at position 81 is Leu, Gln, Gly, Ala, Trp, Arg, Val, or Lys;
Xaa at position 82 is Leu, Gln, Lys, Trp, Arg, Asp, Glu, Asn, His, Thr, Ser, Ala, Tyr, Phe, Ile, Met or Val;
25 Xaa at position 83 is Pro, Ala, Thr, Trp, Arg, or Met;
Xaa at position 84 is Cys, Glu, Gly, Arg, Met, or Val;
Xaa at position 85 is Leu, Asn, Val, or Gln;
Xaa at position 86 is Pro, Cys, Arg, Ala, or Lys;
30 Xaa at position 87 is Leu, Ser, Trp, or Gly;
Xaa at position 88 is Ala, Lys, Arg, Val, or Trp;
Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or Ser;
Xaa at position 90 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;
35 Xaa at position 91 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;
Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, Ala, Gly, Ile

- or Leu;
- Xaa at position 93 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;
- Xaa at position 94 is Arg, Ile, Ser, Glu, Leu, Val, Gln, Lys, His, Ala, or
- 5 Pro;
- Xaa at position 95 is His, Gln, Pro, Arg, Val, Leu, Gly, Thr, Asn, Lys, Ser,
- Ala, Trp, Phe, Ile, or Tyr;
- Xaa at position 96 is Pro, Lys, Tyr, Gly, Ile, or Thr;
- 10 Xaa at position 97 is Ile, Val, Lys, Ala, or Asn;
- Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr, Glu, Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;
- Xaa at position 99 is Ile, Leu, Arg, Asp, Val, Pro, Gln, Gly, Ser, Phe, or His;
- 15 Xaa at position 100 is Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln, or Pro;
- Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val, Tyr, Glu, Asn, Ser, Ala, Gly, Ile, Leu, or Gln;
- Xaa at position 102 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;
- 20 Xaa at position 103 is Asp, or Ser;
- Xaa at position 104 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu, Gln, Lys, Ala, Phe, or Gly;
- Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr, Leu, Lys, Ile, Asp, or His;
- 25 Xaa at position 106 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;
- Xaa at position 108 is Arg, Lys, Asp, Leu, Thr, Ile, Gln, His, Ser, Ala or
- Pro;
- Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly;
- 30 Xaa at position 110 is Lys, Ala, Asn, Thr, Leu, Arg, Gln, His, Glu, Ser, Ala,
- or Trp;
- Xaa at position 111 is Leu, Ile, Arg, Asp, or Met;
- Xaa at position 112 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe;
- 35 Xaa at position 113 is Phe, Ser, Cys, His, Gly, Trp, Tyr, Asp, Lys, Leu, Ile, Val or Asn;

Xaa at position 114 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;
Xaa at position 115 is Leu, Asn, Val, Pro, Arg, Ala, His, Thr,
Trp, or Met;
Xaa at position 116 is Lys, Leu, Pro, Thr, Met, Asp, Val, Glu,
5 Arg, Trp, Ser, Asn, His, Ala, Tyr, Phe, Gln, or Ile;
Xaa at position 117 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;
Xaa at position 118 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;
Xaa at position 119 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;
Xaa at position 120 is Asn, Ala, Pro, Leu, His, Val, or Gln;
10 Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
Gly;
Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
Ile, Tyr, or Cys;
Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;
15 and which can additionally have Met- preceding the amino acid in
position 1; and wherein from 1 to 14 amino acids can be deleted
from the N-terminus and/or from 1 to 15 amino acids can be
deleted from the C-terminus; and wherein from 4 to 44 of the
20 amino acids designated by Xaa are different from the
corresponding amino acids of native (1-133) human interleukin-3.

2. A human interleukin-3 mutant polypeptide of the
25 Formula II:

Ala	Pro	Met	Thr	Gln	Thr	Thr	Ser	Leu	Lys	Thr	Ser	Trp	Val	Asn
1			5	10					15					
Cys	Xaa	Xaa	Xaa	Xaa	Xaa	Glu	Xaa	Xaa	Xaa	Xaa	Leu	Xaa	Xaa	Xaa
			20	25					30					
Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Asn	Leu	Xaa	Xaa	Glu	Xaa	Xaa
			35	40					45					
Xaa	Xaa	Leu	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Asn	Leu	Xaa	Xaa

35

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	50	55	60
	Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa		
	65	70	75
5	Xaa Xaa Leu Xaa Xaa Xaa Xaa Xaa Cys Xaa Pro Xaa Xaa Xaa Xaa		
	80	85	90
	Xaa Xaa Xaa Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asp Xaa Xaa		
10	95	100	105
	Xaa Phe Xaa Xaa Lys Leu Xaa Phe Xaa Xaa Xaa Xaa Leu Xaa Xaa		
	110	115	120
15	Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID NO:16]		
	125	130	

wherein

	Xaa at position 17 is Ser, Gly, Asp, Met, or Gln;
20	Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
	Xaa at position 19 is Met, Phe, Ile, Arg, or Ala;
	Xaa at position 20 is Ile or Pro;
	Xaa at position 21 is Asp or Glu;
	Xaa at position 23 is Ile, Val, Ala, Leu, or Gly;
25	Xaa at position 24 is Ile, Val, Phe, or Leu;
	Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;
	Xaa at position 26 is His, Phe, Gly, Arg, or Ala;
	Xaa at position 28 is Lys, Leu, Gln, Gly, Pro, or Val;
	Xaa at position 29 is Gln, Asn, Leu, Arg, or Val;
30	Xaa at position 30 is Pro, His, Thr, Gly, or Gln;
	Xaa at position 31 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;
	Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;
	Xaa at position 33 is Pro, Leu, Gln, Ala, or Glu;
35	Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln, Glu,
	Ile, Phe, Thr or Met;

- Xaa at position 35 is Leu, Ala, Asn, Pro, Gln, or Val;
 Xaa at position 36 is Asp or Leu;
 Xaa at position 37 is Phe, Ser, Pro, Trp, or Ile;
 Xaa at position 38 is Asn or Ala;
- 5 Xaa at position 41 is Asn, Cys, Arg, His, Met, or Pro;
 Xaa at position 42 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu, Met,
 Tyr, Val or Arg;
 Xaa at position 44 is Asp or Glu;
- 10 Xaa at position 45 is Gln, Val, Met, Leu, Thr, Lys, Ala, Asn, Glu,
 Ser, or Trp;
 Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, Ala, Asn, Gln, Glu,
- 15 His, Ile, Lys, Tyr, Val or Gly;
 Xaa at position 47 is Ile, Val, or His;
 Xaa at position 49 is Met, Asn, or Asp;
 Xaa at position 50 is Glu, Thr, Ala, Asn, Ser or Asp;
 Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;
- 20 Xaa at position 52 is Asn or Gly;
 Xaa at position 53 is Leu, Met, or Phe;
 Xaa at position 54 is Arg, Ala, or Ser;
 Xaa at position 55 is Arg, Thr, Val, Leu, or Gly;
 Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, Ala, Arg, Asn,
- 25 Glu, His, Leu,
 Thr, Val or Lys;
 Xaa at position 59 is Glu, Tyr, His, Leu, or Arg;
 Xaa at position 60 is Ala, Ser, Asn, or Thr;
 Xaa at position 61 is Phe or Ser;
- 30 Xaa at position 62 is Asn, Val, Pro, Thr, or Ile;
 Xaa at position 63 is Arg, Tyr, Lys, Ser, His, or Val;
 Xaa at position 64 is Ala or Asn;
 Xaa at position 65 is Val, Thr, Leu, or Ser;
 Xaa at position 66 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
- 35 Xaa at position 67 is Ser, Phe, Val, Gly, Asn, Ile, or His;
 Xaa at position 68 is Leu, Val, Ile, Phe, or His;

- Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;
Xaa at position 70 is Asn or Pro;
Xaa at position 71 is Ala, Met, Pro, Arg, Glu, Thr, or Gln;
Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
5 Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, Arg, or
Pro;
Xaa at position 74 is Ile or Met;
Xaa at position 75 is Glu, Gly, Asp, Ser, or Gln;
Xaa at position 76 is Ser, Val, Ala, Asn, Glu, Pro, Gly, or
10 Asp;
Xaa at position 77 is Ile, Ser, or Leu;
Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or
Asp;
Xaa at position 80 is Asn, Val, Gly, Thr, Leu, Glu, or Arg;
15 Xaa at position 81 is Leu, or Val;
Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,
His,
Met, Phe, Ser, Thr, Tyr or Val;
Xaa at position 83 is Pro, Ala, Thr, Trp, or Met;
20 Xaa at position 85 is Leu or Val;
Xaa at position 87 is Leu or Ser;
Xaa at position 88 is Ala, Arg, or Trp;
Xaa at position 89 is Thr, Asp, Glu, His, Asn, or Ser;
Xaa at position 90 is Ala, Asp, or Met;
25 Xaa at position 91 is Ala, Pro, Ser, Thr, Phe, Leu, or Asp;
Xaa at position 92 is Pro or Ser;
Xaa at position 93 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;
Xaa at position 95 is His, Pro, Arg, Val, Leu, Gly, Asn, Ile,
Phe,
30 Ser or Thr;
Xaa at position 96 is Pro or Tyr;
Xaa at position 97 is Ile, Val, or Ala;
Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr, Leu,
Arg, Gln, Glu,
35 Lys, Met, Ser, Tyr, Val or Pro;
Xaa at position 99 is Ile, Leu, Val, or Phe;

301

	Ala	Pro	Met	Thr	Gln	Thr	Thr	Ser	Leu	Lys	Thr	Ser	Trp	Val	Asn
	1			5	10					15					
	Cys	Xaa	Xaa	Xaa	Ile	Xaa	Glu	Xaa	Xaa	Xaa	Xaa	Leu	Lys	Xaa	Xaa
5				20	25					30					
	Xaa	Xaa	Xaa	Xaa	Xaa	Asp	Xaa	Xaa	Asn	Leu	Asn	Xaa	Glu	Xaa	Xaa
				35	40					45					
10	Xaa	Ile	Leu	Met	Xaa	Xaa	Asn	Leu	Xaa	Xaa	Xaa	Asn	Leu	Glu	Xaa
				50	55					60					
	Phe	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Asn	Xaa	Xaa	Xaa	Ile	Glu
				65	70					75					
15	Xaa	Xaa	Leu	Xaa	Xaa	Leu	Xaa	Xaa	Cys	Xaa	Pro	Xaa	Xaa	Thr	Ala
				80	85					90					
	Xaa	Pro	Xaa	Arg	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Gly	Asp	Xaa	Xaa
20				95	100					105					
	Xaa	Phe	Xaa	Xaa	Lys	Leu	Xaa	Phe	Xaa	Xaa	Xaa	Xaa	Leu	Glu	Xaa
				110	115					120					
25	Xaa	Xaa	Xaa	Gln	Gln	Thr	Thr	Leu	Ser	Leu	Ala	Ile	Phe	[SEQ ID	
														NO:17]	
				125	130										

wherein

- | | |
|----|---|
| 30 | Xaa at position 17 is Ser, Gly, Asp, Met, or Gln; |
| | Xaa at position 18 is Asn, His, or Ile; |
| | Xaa at position 19 is Met or Ile; |
| | Xaa at position 21 is Asp or Glu; |
| | Xaa at position 23 is Ile, Ala, Leu, or Gly; |
| 35 | Xaa at position 24 is Ile, Val, or Leu; |
| | Xaa at position 25 is Thr, His, Gln, or Ala; |

- Xaa at position 26 is His or Ala;
 Xaa at position 29 is Gln, Asn, or Val;
 Xaa at position 30 is Pro, Gly, or Gln;
 Xaa at position 31 is Pro, Asp, Gly, or Gln;
 5 Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;
 Xaa at position 33 is Pro or Glu;
 Xaa at position 34 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln,
 Glu, Ile, Phe, Thr or Met;
 Xaa at position 35 is Leu, Ala, Asn, Pro, Gln, or Val;
 10 Xaa at position 37 is Phe, Ser, Pro, or Trp;
 Xaa at position 38 is Asn or Ala;
 Xaa at position 42 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu,
 Met, Tyr or Arg;
 Xaa at position 44 is Asp or Glu;
 15 Xaa at position 45 is Gln, Val, Met, Leu, Thr, Ala, Asn, Glu,
 Ser or Lys;
 Xaa at position 46 is Asp, Phe, Ser, Thr, Ala, Asn Gln, Glu, His,
 Ile, Lys, Tyr, Val or Cys;
 Xaa at position 50 is Glu, Ala, Asn, Ser or Asp;
 20 Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;
 Xaa at position 54 is Arg or Ala;
 Xaa at position 55 is Arg, Thr, Val, Leu, or Gly;
 Xaa at position 56 is Pro, Gly, Ser, Gln, Ala, Arg, Asn, Glu,
 Leu, Thr, Val or Lys;
 25 Xaa at position 60 is Ala or Ser;
 Xaa at position 62 is Asn, Pro, Thr, or Ile;
 Xaa at position 63 is Arg or Lys;
 Xaa at position 64 is Ala or Asn;
 Xaa at position 65 is Val or Thr;
 30 Xaa at position 66 is Lys or Arg;
 Xaa at position 67 is Ser, Phe, or His;
 Xaa at position 68 is Leu, Ile, Phe, or His;
 Xaa at position 69 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;
 Xaa at position 71 is Ala, Pro, or Arg;
 35 Xaa at position 72 is Ser, Glu, Arg, or Asp;
 Xaa at position 73 is Ala or Leu;

- Xaa at position 76 is Ser, Val, Ala, Asn, Glu, Pro, or Gly;
- Xaa at position 77 is Ile or Leu;
- Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or Asp;
- 5 Xaa at position 80 is Asn, Gly, Glu, or Arg;
- Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu, His,
- Ile, Met, Phe, Ser, Thr, Tyr or Val;
- Xaa at position 83 is Pro or Thr;
- 10 Xaa at position 85 is Leu or Val;
- Xaa at position 87 is Leu or Ser;
- Xaa at position 88 is Ala or Trp;
- Xaa at position 91 is Ala or Pro;
- Xaa at position 93 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;
- 15 Xaa at position 95 is His, Pro, Arg, Val, Leu, Gly, Asn, Phe, Ser or Thr;
- Xaa at position 96 is Pro or Tyr;
- Xaa at position 97 is Ile or Val;
- Xaa at position 98 is His, Ile, Asn, Leu, Ala, Thr, Leu, Arg, Gln,
- 20 Leu, Lys, Met, Ser, Tyr, Val or Pro;
- Xaa at position 99 is Ile, Leu, or Val;
- Xaa at position 100 is Lys, Arg, Ile, Gln, Pro, or Ser;
- Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Pro, Asn, Ile, Leu or Tyr;
- 25 Xaa at position 104 is Trp or Leu;
- Xaa at position 105 is Asn, Pro, Ala, Ser, Trp, Gln, Tyr, Leu, Lys, Ile, Asp, or His;
- Xaa at position 106 is Glu or Gly;
- 30 Xaa at position 108 is Arg, Ala, or Ser;
- Xaa at position 109 is Arg, Thr, Glu, Leu, or Ser;
- Xaa at position 112 is Thr, Val, or Gln;
- Xaa at position 114 is Tyr or Trp;
- Xaa at position 115 is Leu or Ala;
- 35 Xaa at position 116 is Lys, Thr, Val, Trp, Ser, Ala, His, Met, Phe, Tyr or Ile;

Xaa at position 117 is Thr or Ser;

Xaa at position 120 is Asn, Pro, Leu, His, Val, or Gln;

Xaa at position 121 is Ala, Ser, Ile, Asn, Pro, Asp, or Gly;

Xaa at position 122 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,

5 Ile, Tyr, or Cys;

Xaa at position 123 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

and which can additionally have Met- preceding the amino acid in position 1; and wherein from 1 to 14 amino acids can be deleted

10 from the N-terminus and/or from 1 to 15 amino acids can be
deleted from the C-terminus; and wherein from 4 to 35 of the
amino acids designated by Xaa are different from the
corresponding amino acids of native (1-133)human interleukin-3.

15 4. A human interleukin-3 mutant polypeptide according to
Claim 3 of the Formula IV:

Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr Ser Trp Val Asn
1 5 10 15

20
Cys Xaa Xaa Met Ile Asp Glu Xaa Ile Xaa Xaa Leu Lys Xaa Xaa
20 25 30

Pro Xaa Pro Xaa Xaa Asp Phe Xaa Asn Leu Asn Xaa Glu Asp Xaa
25 35 40 45

Xaa Ile Leu Met Xaa Xaa Asn Leu Arg Xaa Xaa Asn Leu Glu Ala
50 55 60

30 Phe Xaa Arg Xaa Xaa Lys Xaa Xaa Xaa Asn Ala Ser Ala Ile Glu
 65 70 75

Xaa Xaa Leu Xaa Xaa Leu Xaa Pro Cys Leu Pro Xaa Xaa Thr Ala
80 85 90

35
Xaa Pro Xaa Arg Xaa Pro Ile Xaa Xaa Xaa Xaa Gly Asp Trp Xaa

305

95 100 105

Glu Phe Xaa Xaa Lys Leu Xaa Phe Tyr Leu Xaa Xaa Leu Glu Xaa
110 115 120

5

Xaa Xaa Xaa Gln Gln Thr Thr Leu Ser Leu Ala Ile Phe [SEQ ID
NO:18]

125 130

wherein

- 10 Xaa at position 17 is Ser, Gly, Asp, or Gln;
Xaa at position 18 is Asn, His, or Ile;
Xaa at position 23 is Ile, Ala, Leu, or Gly;
Xaa at position 25 is Thr, His, or Gln;
Xaa at position 26 is His or Ala;
- 15 Xaa at position 29 is Gln or Asn;
Xaa at position 30 is Pro or Gly;
Xaa at position 32 is Leu, Arg, Asn, or Ala;
Xaa at position 34 is Leu, Val, Ser, Ala, Arg, Gln, Glu, Ile,
Phe, Thr, or Met;
- 20 Xaa at position 35 is Leu, Ala, Asn, or Pro;
Xaa at position 38 is Asn or Ala;
Xaa at position 42 is Gly, Asp, Ser, Ala, Asn, Ile, Leu, Met,
Tyr or Arg;
Xaa at position 45 is Gln, Val, Met, Leu, Ala, Asn, Glu, or Lys;
- 25 Xaa at position 46 is Asp, Phe, Ser, Gln, Glu, His, Val
or Thr;
Xaa at position 50 is Glu Asn, Ser or Asp;
Xaa at position 51 is Asn, Arg, Pro, Thr, or His;
Xaa at position 55 is Arg, Leu, or Gly;
- 30 Xaa at position 56 is Pro, Gly, Ser, Ala, Asn, Val, Leu or Gln;
Xaa at position 62 is Asn, Pro, or Thr;
Xaa at position 64 is Ala or Asn;
Xaa at position 65 is Val or Thr;
Xaa at position 67 is Ser or Phe;
- 35 Xaa at position 68 is Leu or Phe;
Xaa at position 69 is Gln, Ala, Glu, or Arg;

- Xaa at position 76 is Ser, Val, Asn, Pro, or Gly;
Xaa at position 77 is Ile or Leu;
Xaa at position 79 is Lys, Gly, Asn, Met, Arg, Ile, or Gly;
Xaa at position 80 is Asn, Gly, Glu, or Arg;
5 Xaa at position 82 is Leu, Gln, Trp, Arg, Asp, Asn, Glu, His,
Met,
Phe, Ser, Thr, Tyr or Val;
Xaa at position 87 is Leu or Ser;
Xaa at position 88 is Ala or Trp;
10 Xaa at position 91 is Ala or Pro;
Xaa at position 93 is Thr, Asp, or Ala;
Xaa at position 95 is His, Pro, Arg, Val, Gly, Asn, Ser or Thr;
Xaa at position 98 is His, Ile, Asn, Ala, Thr, Gln, Glu,
Lys, Met, Ser, Tyr, Val or Leu;
15 Xaa at position 99 is Ile or Leu;
Xaa at position 100 is Lys or Arg;
Xaa at position 101 is Asp, Pro, Met, Lys, Thr, His, Pro, Asn,
Ile,
Leu or Tyr;
20 Xaa at position 105 is Asn, Pro, Ser, Ile or Asp;
Xaa at position 108 is Arg, Ala, or Ser;
Xaa at position 109 is Arg, Thr, Glu, Leu, or Ser;
Xaa at position 112 is Thr or Gln;
Xaa at position 116 is Lys, Val, Trp, Ala, His, Phe, Tyr or Ile;
25 Xaa at position 117 is Thr or Ser;
Xaa at position 120 is Asn, Pro, Leu, His, Val, or Gln;
Xaa at position 121 is Ala, Ser, Ile, Pro, or Asp;
Xaa at position 122 is Gln, Met, Trp, Phe, Pro, His, Ile, or Tyr;
Xaa at position 123 is Ala, Met, Glu, Ser, or Leu;
30
and which can additionally have Met- preceding the amino acid in
position 1; and wherein from 1 to 14 amino acids can be deleted
from the N-terminus and/or from 1 to 15 amino acids can be
deleted from the C-terminus; and wherein from 4 to 44 of the
35 amino acids designated by Xaa are different from the
corresponding amino acids of native (1-133)human interleukin-3.

5. The human interleukin-3 mutant polypeptide of claim 1 wherein 1-15 amino acids are deleted from the C-terminus and/or 1-14 amino acids are deleted from the N-terminus.

5

6. The human interleukin-3 mutant polypeptide of claim 1 wherein;

- Xaa at position 42 is Gly, Asp, Ser, Ile, Leu, Met, Tyr, or Ala;
- 10 Xaa at position 45 is Gln, Val, Met or Asn;
- Xaa at position 46 is Asp, Ser, Gln, His or Val;
- Xaa at position 50 is Glu or Asp;
- Xaa at position 51 is Asn, Pro or Thr;
- Xaa at position 62 is Asn or Pro;
- 15 Xaa at position 76 is Ser, or Pro;
- Xaa at position 82 is Leu, Trp, Asp, Asn Glu, His, Phe, Ser or Tyr;
- Xaa at position 95 is His, Arg, Thr, Asn or Ser;
- Xaa at position 98 is His, Ile, Leu, Ala, Gln, Lys, Met, Ser,
- 20 Tyr or Val;
- Xaa at position 100 is Lys or Arg;
- Xaa at position 101 is Asp, Pro, His, Asn, Ile or Leu;
- Xaa at position 105 is Asn, or Pro;
- Xaa at position 108 is Arg, Ala, or Ser;
- 25 Xaa at position 116 is Lys, Val, Trp, Ala, His, Phe, or Tyr;
- Xaa at position 121 is Ala, or Ile;
- Xaa at position 122 is Gln, or Ile; and
- Xaa at position 123 is Ala, Met or Glu.

30 7. A (15-125)human interleukin-3 mutant polypeptide of the Formula V:

Asn	Cys	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
1			5		10					15					

35

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Asn Xaa Xaa Xaa Xaa Xaa

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		20	25		30
		Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa			
		35	40		45
5		Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa			
		50	55		60
		Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa			
10		65	70		75
		Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa			
		80	85		90
15		Xaa Xaa Phe Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa			
		95	100		105
		Xaa Xaa Xaa Xaa Gln Gln [SEQ ID NO:19]			
		110			
20		wherein			
		Xaa at position 3 is Ser, Lys, Gly, Asp, Met, Gln, or Arg;			
		Xaa at position 4 is Asn, His, Leu, Ile, Phe, Arg, or Gln;			
		Xaa at position 5 is Met, Phe, Ile, Arg, Gly, Ala, or Cys;			
25		Xaa at position 6 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;			
		Xaa at position 7 is Asp, Phe, Lys, Arg, Ala, Gly, Glu, Gln, Asn,			
		Thr, Ser or Val;			
		Xaa at position 8 is Glu, Trp, Pro, Ser, Ala, His, Asp, Asn, Gln,			
		Leu, Val, or Gly;			
30		Xaa at position 9 is Ile, Val, Ala, Leu, Gly, Trp, Lys, Phe,			
		Leu, Ser, or Arg;			
		Xaa at position 10 is Ile, Gly, Val, Arg, Ser, Phe, or Leu;			
		Xaa at position 11 is Thr, His, Gly, Gln, Arg, Pro, or Ala;			
		Xaa at position 12 is His, Thr, Phe, Gly, Arg, Ala, or Trp;			
35		Xaa at position 13 is Leu, Gly, Arg, Thr, Ser, or Ala;			
		Xaa at position 14 is Lys, Arg, Leu, Gln, Gly, Pro, Val or Trp;			

Xaa at position 15 is Gln, Asn, Leu, Pro, Arg, or Val;

Xaa at position 16 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or Lys;

Xaa at position 17 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;

5 Xaa at position 18 is Leu, Val, Arg, Gln, Asn, Gly, Ala, or Glu;

Xaa at position 19 is Pro, Leu, Gln, Ala, Thr, or Glu;

Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Glu, Gln, Thr,
Arg, Ala, Phe, Ile or Met;

Xaa at position 21 is Leu, Ala, Gly, Asn, Pro, Gln, or Val;

10 Xaa at position 22 is Asp, Leu, or Val;

Xaa at position 23 is Phe, Ser, Pro, Trp, or Ile;

Xaa at position 24 is Asn, or Ala;

Xaa at position 26 is Leu, Trp, or Arg;

Xaa at position 27 is Asn, Cys, Arg, Leu, His, Met, Pro;

15 Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Lys, Asn, Thr,
Leu,

Val, Glu, Phe, Tyr, Ile or Met;

Xaa at position 29 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys,
Gln,

20 Arg, Thr, Gly or Ser;

Xaa at position 30 is Asp, Ser, Leu, Arg, Lys, Thr, Met, Trp, Glu, Asn, Gln, Ala or Pro;

Xaa at position 31 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys, Asp,

25 Asn, Arg, Ser, Ala, Ile, Glu, His or Trp;

Xaa at position 32 is Asp, Phe, Ser, Thr, Cys, Glu, Asn, Gln,
Lys, His, Ala, Tyr, Ile, Val or Gly;

Xaa at position 33 is Ile, Gly, Val, Ser, Arg, Pro, or His;

Xaa at position 34 is Leu, Ser, Cys, Arg, Ile, His, Phe, Glu,

30 Lys, Thr, Ala, Met, Val or Asn;

Xaa at position 35 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;

Xaa at position 36 is Glu, Leu, Thr, Asp, Tyr, Lys, Asn, Ser,
Ala,

Ile, Val, His, Phe, Met or Gln;

35 Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;

Xaa at position 38 is Asn, His, Arg, Leu, Gly, Ser, or Thr;

- Xaa at position 39 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser,
Met, or;
- Xaa at position 40 is Arg, Asp, Ile, Ser, Val, Thr, Gln, Asn,
Lys, His, Ala or Leu;
- 5 Xaa at position 41 is Arg, Thr, Val, Ser, Leu, or Gly;
Xaa at position 42 is Pro, Gly, Cys, Ser, Gln, Glu, Arg, His,
Thr, Ala, Tyr, Phe, Leu, Val or Lys;
Xaa at position 43 is Asn or Gly;
Xaa at position 44 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;
- 10 Xaa at position 45 is Glu Tyr, His, Leu, Pro, or Arg;
Xaa at position 46 is Ala, Ser, Pro, Tyr, Asn, or Thr;
Xaa at position 47 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;
Xaa at position 48 is Asn, His, Val, Arg, Pro, Thr, Asp, or Ile;
Xaa at position 49 is Arg, Tyr, Trp, Lys, Ser, His, Pro, or Val;
- 15 Xaa at position 50 is Ala, Asn, Pro, Ser, or Lys;
Xaa at position 51 is Val, Thr, Pro, His, Leu, Phe, or Ser;
Xaa at position 52 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
Xaa at position 53 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or
His;
- 20 Xaa at position 54 is Leu, Val, Trp, Ser, Ile, Phe, Thr, or His;
Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, Trp, Gly, or
Leu;
Xaa at position 56 is Asn, Leu, Val, Trp, Pro, or Ala;
Xaa at position 57 is Ala, Met, Leu, Pro, Arg, Glu, Thr, Gln,
Trp, or Asn;
- 25 Xaa at position 58 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
Xaa at position 59 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;
Xaa at position 60 is Ile, Met, Thr, Pro, Arg, Gly, Ala;
Xaa at position 61 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser,
Gln, or Leu;
- 30 Xaa at position 62 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or
Asp;
Xaa at position 63 is Ile, Ser, Arg, Thr, or Leu;
Xaa at position 64 is Leu, Ala, Ser, Glu, Phe, Gly, or Arg;
- 35 Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, or
Asp;

- Xaa at position 66 is Asn, Trp, Val, Gly, Thr, Leu, Glu, or Arg;
Xaa at position 67 is Leu, Gln, Gly, Ala, Trp, Arg, Val, or Lys;
Xaa at position 68 is Leu, Gln, Lys, Trp, Arg, Asp, Glu, Asn,
His, Thr, Ser, Ala, Tyr, Phe, Ile, Met or Val;
- 5 Xaa at position 69 is Pro, Ala, Thr, Trp, Arg, or Met;
Xaa at position 70 is Cys, Glu, Gly, Arg, Met, or Val;
Xaa at position 71 is Leu, Asn, Val, or Gln;
Xaa at position 72 is Pro, Cys, Arg, Ala, or Lys;
Xaa at position 73 is Leu, Ser, Trp, or Gly;
- 10 Xaa at position 74 is Ala, Lys, Arg, Val, or Trp;
Xaa at position 75 is Thr, Asp, Cys, Leu, Val, Glu, His, Asn, or
Ser;
- Xaa at position 76 is Ala, Pro, Ser, Thr, Gly, Asp, Ile, or Met;
Xaa at position 77 is Ala, Pro, Ser, Thr, Phe, Leu, Asp, or His;
- 15 Xaa at position 78 is Pro, Phe, Arg, Ser, Lys, His, Ala, Gly, Ile
or Leu;
- Xaa at position 79 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;
Xaa at position 80 is Arg, Ile, Ser, Glu, Leu, Val, Gln, Lys,
His,
- 20 Ala or Pro;
- Xaa at position 81 is His, Gln, Pro, Arg, Val, Leu, Gly, Thr,
Asn,
Lys, Ser, Ala, Trp, Phe, Ile or Tyr;
- Xaa at position 82 is Pro, Lys, Tyr, Gly, Ile, or Thr;
- 25 Xaa at position 83 is Ile, Val, Lys, Ala, or Asn;
Xaa at position 84 is His, Ile, Asn, Leu, Asp, Ala, Thr, Glu,
Gln, Ser, Phe, Met, Val, Lys, Arg, Tyr or Pro;
- Xaa at position 85 is Ile, Leu, Arg, Asp, Val, Pro, Gln,
Gly, Ser, Phe, or His;
- 30 Xaa at position 86 is Lys, Tyr, Leu, His, Arg, Ile, Ser, Gln,
Pro;
- Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Val,
Tyr, Glu, Asn, Ser, Ala, Gly, Ile, Leu or Gln;
- Xaa at position 88 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;
- 35 Xaa at position 89 is Asp, or Ser;
- Xaa at position 90 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu,

- Gln, Lys, Ala, Phe, or Gly;
Xaa at position 91 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
Leu, Lys, Ile, Asp, or His;
Xaa at position 92 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;
5 Xaa at position 94 is Arg, Lys, Asp, Leu, Thr, Ile, Gln,
His, Ser, Ala, or Pro;
Xaa at position 95 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly;
Xaa at position 96 is Lys, Asn, Thr, Leu, Gln, Arg,
His, Glu, Ser, Ala or Trp;
10 Xaa at position 97 is Leu, Ile, Arg, Asp, or Met;
Xaa at position 98 is Thr, Val, Gln, Tyr, Glu, His, Ser, or Phe;
Xaa at position 99 is Phe, Ser, Cys, His, Gly, Trp, Tyr, Asp,
Lys, Leu, Ile, Val or Asn;
Xaa at position 100 is Tyr, Cys, His, Ser, Trp, Arg, or Leu;
15 Xaa at position 101 is Leu, Asn, Val, Pro, Arg, Ala, His, Thr,
Trp, or Met;
Xaa at position 102 is Lys, Leu, Pro, Thr, Met, Asp, Val, Glu,
Arg, Trp, Ser,
Asn, His, Ala, Tyr, Phe, Gln, or Ile;
20 Xaa at position 103 is Thr, Ser, Asn, Ile, Trp, Lys, or Pro;
Xaa at position 104 is Leu, Ser, Pro, Ala, Glu, Cys, Asp, or Tyr;
Xaa at position 105 is Glu, Ser, Lys, Pro, Leu, Thr, Tyr, or Arg;
Xaa at position 106 is Asn, Ala, Pro, Leu, His, Val, or Gln;
Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
25 Gly;
Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
Ile, Tyr, or Cys;
Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;
30 and which can additionally have Met- or Met-Ala- preceding the
amino acid in position 1; and wherein from 4 to 44 of the amino
acids designated by Xaa are different from the corresponding
native amino acids of (1-133) human interleukin-3; or a
polypeptide having substantially the same structure and
35 substantially the same biological activity.

8. A (15-125)human interleukin-3 mutant polypeptide
of the Formula VI:

	Asn	Cys	Xaa	Xaa	Xaa	Xaa	Xaa	Glu	Xaa	Xaa	Xaa	Xaa	Leu	Xaa	Xaa
5	1			5		10							15		
	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Asn	Leu	Xaa	Xaa	Glu	Xaa
				20		25							30		
10	Xaa	Xaa	Xaa	Leu	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Asn	Leu	Xaa
				35		40							45		
	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa
				50		55							60		
15	Xaa	Xaa	Xaa	Leu	Xaa	Xaa	Xaa	Xaa	Xaa	Cys	Xaa	Pro	Xaa	Xaa	Xaa
				65		70							75		
	Xaa	Xaa	Xaa	Xaa	Arg	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Xaa	Asp	Xaa
20				80		85							90		
	Xaa	Xaa	Phe	Xaa	Xaa	Lys	Leu	Xaa	Phe	Xaa	Xaa	Xaa	Xaa	Leu	Xaa
				95		100							105		
25	Xaa	Xaa	Xaa	Xaa	Gln	Gln	[SEQ ID NO:20]								
				110											

wherein

- Xaa at position 3 is Ser, Gly, Asp, Met, or Gln;
- 30 Xaa at position 4 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
- Xaa at position 5 is Met, Phe, Ile, Arg, or Ala;
- Xaa at position 6 is Ile or Pro;
- Xaa at position 7 is Asp, or Glu;
- Xaa at position 9 is Ile, Val, Ala, Leu, or Gly;
- 35 Xaa at position 10 is Ile, Val, Phe, or Leu;
- Xaa at position 11 is Thr, His, Gly, Gln, Arg, Pro, or Ala;

- Xaa at position 12 is His, Phe, Gly, Arg, or Ala;
Xaa at position 14 is Lys, Leu, Gln, Gly, Pro, or Val;
Xaa at position 15 is Gln, Asn, Leu, Arg, or Val;
Xaa at position 16 is Pro, His, Thr, Gly, or Gln;
5 Xaa at position 17 is Pro, Asp, Gly, Ala, Arg, Leu, or Gln;
Xaa at position 18 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;
Xaa at position 19 is Pro, Leu, Gln, Ala, or Glu;
Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Ala, Arg, Gln,
Glu, Ile, Phe, Thr or Met;
10 Xaa at position 21 is Leu, Ala, Asn, Pro, Gln, or Val;
Xaa at position 22 is Asp or Leu;
Xaa at position 23 is Phe, Ser, Pro, Trp, or Ile;
Xaa at position 24 is Asn or Ala;
Xaa at position 27 is Asn, Cys, Arg, His, Met, or Pro;
15 Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Asn, Ile, Leu,
Met, Tyr, or Arg;
Xaa at position 30 is Asp, or Glu;
Xaa at position 31 is Gln, Val, Met, Leu, Thr, Lys, Ala, Asn Glu,
Ser or Trp;
20 Xaa at position 32 is Asp, Phe, Ser, Thr, Cys, Ala, Asn, Gln,
Glu, His, Ile, Lys, Tyr, Val or Gly;
Xaa at position 33 is Ile, Val, or His;
Xaa at position 35 is Met, Asn, or Asp;
Xaa at position 36 is Glu, Thr, Ala, Asn, Ser or Asp;
25 Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;
Xaa at position 38 is Asn or Gly;
Xaa at position 39 is Leu, Met, or Phe;
Xaa at position 40 is Arg, Ala or Ser;
Xaa at position 41 is Arg, Thr, Val, Leu, or Gly;
30 Xaa at position 42 is Pro, Gly, Cys, Ser, Gln, Ala, Arg, Asn,
Glu, His, Leu, Thr, Val or Lys;
Xaa at position 45 is Glu, Tyr, His, Leu, or Arg;
Xaa at position 46 is Ala, Ser, Asn, or Thr;
Xaa at position 47 is Phe or Ser;
35 Xaa at position 48 is Asn, Val, Pro, Thr, or Ile;
Xaa at position 49 is Arg, Tyr, Lys, Ser, His, or Val;

- Xaa at position 50 is Ala or Asn;
Xaa at position 51 is Val, Thr, Leu, or Ser;
Xaa at position 52 is Lys, Ile, Arg, Val, Asn, Glu, or Ser;
Xaa at position 53 is Ser, Phe, Val, Gly, Asn, Ile, or His;
5 Xaa at position 54 is Leu, Val, Ile, Phe, or His;
Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;
Xaa at position 56 is Asn or Pro;
Xaa at position 57 is Ala, Met, Pro, Arg, Glu, Thr, or Gln;
Xaa at position 58 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
10 Xaa at position 59 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, Arg, or
Pro;
Xaa at position 60 is Ile or Met;
Xaa at position 61 is Glu, Gly, Asp, Ser, or Gln;
Xaa at position 62 is Ser, Val, Ala, Asn, Glu, Pro, Gly, or
15 Asp;
Xaa at position 63 is Ile, Ser, or Leu;
Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, or
Asp;
Xaa at position 66 is Asn, Val, Gly, Thr, Leu, Glu, or Arg;
20 Xaa at position 67 is Leu, or Val;
Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,
His, Met, Phe, Ser, Thr, Tyr or Val;
Xaa at position 69 is Pro, Ala, Thr, Trp, or Met;
Xaa at position 71 is Leu or Val;
25 Xaa at position 73 is Leu or Ser;
Xaa at position 74 is Ala, Arg, or Trp;
Xaa at position 75 is Thr, Asp, Glu, His, Asn, or Ser;
Xaa at position 76 is Ala, Asp, or Met;
Xaa at position 77 is Ala, Pro, Ser, Thr, Phe, Leu, or Asp;
30 Xaa at position 78 is Pro or Ser;
Xaa at position 79 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;
Xaa at position 81 is His, Pro, Arg, Val, Leu, Gly, Asn, Ile,
Phe,
Ser or Thr;
35 Xaa at position 82 is Pro or Tyr;
Xaa at position 83 is Ile, Val, or Ala;

- Xaa at position 84 is His, Ile, Asn, Leu, Asp, Ala, Thr,
Arg, Gln, Glu, Lys, Met, Ser, Tyr, Val or Pro;
Xaa at position 85 is Ile, Leu, Val, or Phe;
Xaa at position 86 is Lys, Leu, His, Arg, Ile, Gln, Pro or
5 Ser;
Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Val,
Asn, Ile, Leu or Tyr;
Xaa at position 88 is Gly, Glu, Lys, or Ser;
Xaa at position 90 is Trp, Val, Tyr, Met, or Leu;
10 Xaa at position 91 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
Leu, Lys, Ile, Asp, or His;
Xaa at position 92 is Glu, Ser, Ala, or Gly;
Xaa at position 94 is Arg, Ala, Gln, Ser or Lys;
Xaa at position 95 is Arg, Thr, Glu, Leu, Ser, or Gly;
15 Xaa at position 98 is Thr, Val, Gln, Glu, His, or Ser;
Xaa at position 100 is Tyr or Trp;
Xaa at position 101 is Leu or Ala;
Xaa at position 102 is Lys, Thr, Met, Val, Trp, Ser, Leu,
Ala, Asn, Gln, His, Met, Phe, Tyr or Ile;
20 Xaa at position 103 is Thr, Ser, or Asn;
Xaa at position 105 is Glu, Ser, Pro, Leu, Thr, or Tyr;
Xaa at position 106 is Asn, Pro, Leu, His, Val, or Gln;
Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Lys, Asp, or
Gly;
25 Xaa at position 108 is Gln, Ser, Met, Trp, Arg, Phe, Pro, His,
Ile, Tyr, or Cys;
Xaa at position 109 is Ala, Met, Glu, His, Ser, Pro, Tyr, or Leu;

and which can additionally have Met- or Met-Ala- preceding the
30 amino acid in position 1; and wherein from 4 to 44 of the amino
acids designated by Xaa are different from the corresponding
amino acids of native (1-133) human interleukin-3; or a
polypeptide having substantially the same structure and
substantially the same biological activity.

35

9. A (15-125)human interleukin-3 mutant polypeptide

- Xaa at position 15 is Gln, Asn, or Val;
 Xaa at position 16 is Pro, Gly, or Gln;
 Xaa at position 17 is Pro, Asp, Gly, or Gln;
 Xaa at position 18 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;
 5 Xaa at position 19 is Pro or Glu;
 Xaa at position 20 is Leu, Val, Gly, Ser, Lys, Ala, Arg,
 Gln, Glu, Ile, Phe, Thr or Met;
 Xaa at position 21 is Leu, Ala, Asn, Pro, Gln, or Val;
 Xaa at position 23 is Phe, Ser, Pro, or Trp;
 10 Xaa at position 24 is Asn or Ala;
 Xaa at position 28 is Gly, Asp, Ser, Cys, Ala, Asn, Ile,
 Leu, Met Tyr or Arg;
 Xaa at position 30 is Asp or Glu;
 Xaa at position 31 is Gln, Val, Met, Leu, Thr, Ala, Asn,
 15 Glu, Ser or Lys;
 Xaa at position 32 is Asp, Phe, Ser, Thr, Ala, Asn, Gln, Glu,
 His, Ile, Lys, Tyr, Val or Cys;
 Xaa at position 36 is Glu, Ala, Asn, Ser or Asp;
 Xaa at position 37 is Asn, Arg, Met, Pro, Ser, Thr, or His;
 20 Xaa at position 40 is Arg or Ala;
 Xaa at position 41 is Arg, Thr, Val, Leu, or Gly;
 Xaa at position 42 is Pro, Gly, Ser, Gln, Ala, Arg, Asn, Glu,
 Leu, Thr, Val or Lys;
 Xaa at position 46 is Ala or Ser;
 25 Xaa at position 48 is Asn, Pro, Thr, or Ile;
 Xaa at position 49 is Arg or Lys;
 Xaa at position 50 is Ala or Asn;
 Xaa at position 51 is Val or Thr;
 Xaa at position 52 is Lys or Arg;
 30 Xaa at position 53 is Ser, Phe, or His;
 Xaa at position 54 is Leu, Ile, Phe, or His;
 Xaa at position 55 is Gln, Ala, Pro, Thr, Glu, Arg, or Gly;
 Xaa at position 57 is Ala, Pro, or Arg;
 Xaa at position 58 is Ser, Glu, Arg, or Asp;
 35 Xaa at position 59 is Ala or Leu;
 Xaa at position 62 is Ser, Val, Ala, Asn, Glu, Pro, or Gly;

- Xaa at position 63 is Ile or Leu;
Xaa at position 65 is Lys, Thr, Gly, Asn, Met, Arg, Ile, Gly, or
Asp;
Xaa at position 66 is Asn, Gly, Glu, or Arg;
5 Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Ala, Asn, Glu,
His, Ile, Met, Phe, Ser, Thr, Tyr or Val;
Xaa at position 69 is Pro or Thr;
Xaa at position 71 is Leu or Val;
Xaa at position 73 is Leu or Ser;
10 Xaa at position 74 is Ala or Trp;
Xaa at position 77 is Ala or Pro;
Xaa at position 79 is Thr, Asp, Ser, Pro, Ala, Leu, or Arg;
Xaa at position 81 is His, Pro, Arg, Val, Leu, Gly, Asn, Phe,
Ser or Thr;
15 Xaa at position 82 is Pro or Tyr;
Xaa at position 83 is Ile or Val;
Xaa at position 84 is His, Ile, Asn, Leu, Ala, Thr, Leu, Arg,
Gln, Leu, Lys, Met, Ser, Tyr, Val or Pro;
Xaa at position 85 is Ile, Leu, or Val;
20 Xaa at position 86 is Lys, Arg, Ile, Gln, Pro, or Ser;
Xaa at position 87 is Asp, Pro, Met, Lys, His, Thr, Asn, Ile,
Leu or Tyr;
Xaa at position 90 is Trp or Leu;
Xaa at position 91 is Asn, Pro, Ala, Ser, Trp, Gln, Tyr, Leu,
25 Lys, Ile, Asp, or His;
Xaa at position 92 is Glu, or Gly;
Xaa at position 94 is Arg, Ala, or Ser;
Xaa at position 95 is Arg, Thr, Glu, Leu, or Ser;
Xaa at position 98 is Thr, Val, or Gln;
30 Xaa at position 100 is Tyr or Trp;
Xaa at position 101 is Leu or Ala;
Xaa at position 102 is Lys, Thr, Val, Trp, Ser, Ala, His,
Met, Phe, Tyr or Ile;
Xaa at position 103 is Thr or Ser;
35 Xaa at position 106 is Asn, Pro, Leu, His, Val, or Gln;
Xaa at position 107 is Ala, Ser, Ile, Asn, Pro, Asp, or Gly;

- Xaa at position 3 is Ser, Gly, Asp, or Gln;
- Xaa at position 4 is Asn, His, or Ile;
- Xaa at position 9 is Ile, Ala, Leu, or Gly;
- Xaa at position 11 is Thr, His, or Gln;
- 5 Xaa at position 12 is His or Ala;
- Xaa at position 15 is Gln or Asn;
- Xaa at position 16 is Pro or Gly;
- Xaa at position 18 is Leu, Arg, Asn, or Ala;
- Xaa at position 20 is Leu, Val, Ser, Ala, Arg, Gln, Glu, Ile,
- 10 Phe, Thr or Met;
- Xaa at position 21 is Leu, Ala, Asn, or Pro;
- Xaa at position 24 is Asn or Ala;
- Xaa at position 28 is Gly, Asp, Ser, Ala, Asn, Ile, Leu, Met,
- Tyr or Arg;
- 15 Xaa at position 31 is Gln, Val, Met, Leu, Ala, Asn, Glu or Lys;
- Xaa at position 32 is Asp, Phe, Ser, Ala, Gln, Glu, His, Val
- or Thr;
- Xaa at position 36 is Glu, Asn, Ser or Asp;
- Xaa at position 37 is Asn, Arg, Pro, Thr, or His;
- 20 Xaa at position 41 is Arg, Leu, or Gly;
- Xaa at position 42 is Pro, Gly, Ser, Ala, Asn, Val, Leu or Gln;
- Xaa at position 48 is Asn, Pro, or Thr;
- Xaa at position 50 is Ala or Asn;
- Xaa at position 51 is Val or Thr;
- 25 Xaa at position 53 is Ser or Phe;
- Xaa at position 54 is Leu or Phe;
- Xaa at position 55 is Gln, Ala, Glu, or Arg;
- Xaa at position 62 is Ser, Val, Asn, Pro, or Gly;
- Xaa at position 63 is Ile or Leu;
- 30 Xaa at position 65 is Lys, Asn, Met, Arg, Ile, or Gly;
- Xaa at position 66 is Asn, Gly, Glu, or Arg;
- Xaa at position 68 is Leu, Gln, Trp, Arg, Asp, Asn, Glu, His,
- Met, Phe, Ser, Thr, Tyr or Val;
- Xaa at position 73 is Leu or Ser;
- 35 Xaa at position 74 is Ala or Trp;
- Xaa at position 77 is Ala or Pro;

- 30 Xaa at position 17 is Ser, Lys, Asp, Met, Gln, or Arg;
Xaa at position 18 is Asn, His, Leu, Ile, Phe, Arg, or Gln;
Xaa at position 19 is Met, Arg, Gly, Ala, or Cys;
Xaa at position 20 is Ile, Cys, Gln, Glu, Arg, Pro, or Ala;
Xaa at position 21 is Asp, Phe, Lys, Arg, Ala, Gly, or Val;
35 Xaa at position 22 is Glu, Trp, Pro, Ser, Ala, His, or Gly;
Xaa at position 23 is Ile, Ala, Gly, Trp, Lys, Leu, Ser, or Arg;

- Xaa at position 24 is Ile, Gly, Arg, or Ser;
Xaa at position 25 is Thr, His, Gly, Gln, Arg, Pro, or Ala;
Xaa at position 26 is His, Thr, Phe, Gly, Ala, or Trp;
Xaa at position 27 is Leu, Gly, Arg, Thr, Ser, or Ala;
5 Xaa at position 28 is Lys, Leu, Gln, Gly, Pro, Val or Trp;
Xaa at position 29 is Gln, Asn, Loh, Pro, Arg, or Val;
Xaa at position 30 is Pro, His, Thr, Gly, Asp, Gln, Ser, Leu, or Lys;
Xaa at position 31 is Pro, Asp, Gly, Arg, Leu, or Gln;
10 Xaa at position 32 is Leu, Arg, Gln, Asn, Gly, Ala, or Glu;
Xaa at position 33 is Pro, Leu, Gln, Thr, or Glu;
Xaa at position 34 is Leu, Gly, Ser, or Lys;
Xaa at position 35 is Leu, Ala, Gly, Asn, Pro, or Gln;
Xaa at position 36 is Asp, Leu, or Val;
15 Xaa at position 37 is Phe, Ser, or Pro;
Xaa at position 38 is Asn, or Ala;
Xaa at position 40 is Leu, Trp, or Arg;
Xaa at position 41 is Asn, Cys, Arg, Leu, His, Met, Pro;
Xaa at position 42 is Gly, Asp, Ser, Cys, or Ala;
20 Xaa at position 42 is Glu, Asn, Tyr, Leu, Phe, Asp, Ala, Cys, or Ser;
Xaa at position 44 is Asp, Ser, Leu, Arg, Lys, Thr, Met, Trp, or Pro;
Xaa at position 45 is Gln, Pro, Phe, Val, Met, Leu, Thr, Lys, or Trp;
25 Xaa at position 46 is Asp, Phe, Ser, Thr, Cys, or Gly;
Xaa at position 47 is Ile, Gly, Ser, Arg, Pro, or His;
Xaa at position 48 is Leu, Ser, Cys, Arg, His, Phe, or Asn;
Xaa at position 49 is Met, Arg, Ala, Gly, Pro, Asn, His, or Asp;
30 Xaa at position 50 is Glu, Leu, Thr, Asp, or Tyr;
Xaa at position 51 is Asn, Arg, Met, Pro, Ser, Thr, or His;
Xaa at position 52 is Asn, His, Arg, Leu, Gly, Ser, or Thr;
Xaa at position 53 is Leu, Thr, Ala, Gly, Glu, Pro, Lys, Ser, or;
Xaa at position 54 is Arg, Asp, Ile, Ser, Val, Thr, Gln, or Leu;
35 Xaa at position 55 is Arg, Thr, Val, Ser, Leu, or Gly;
Xaa at position 56 is Pro, Gly, Cys, Ser, Gln, or Lys;

- Xaa at position 57 is Asn or Gly;
- Xaa at position 58 is Leu, Ser, Asp, Arg, Gln, Val, or Cys;
- Xaa at position 59 is Glu Tyr, His, Leu, Pro, or Arg;
- Xaa at position 60 is Ala, Ser, Tyr, Asn, or Thr;
- 5 Xaa at position 61 is Phe, Asn, Glu, Pro, Lys, Arg, or Ser;
- Xaa at position 62 is Asn His, Val, Arg, Pro, Thr, or Ile;
- Xaa at position 63 is Arg, Tyr, Trp, Ser, Pro, or Val;
- Xaa at position 64 is Ala, Asn, Ser, or Lys;
- Xaa at position 65 is Val, Thr, Pro, His, Leu, Phe, or Ser;
- 10 Xaa at position 66 is Lys, Ile, Val, Asn, Glu, or Ser;
- Xaa at position 67 is Ser, Ala, Phe, Val, Gly, Asn, Ile, Pro, or His;
- Xaa at position 68 is Leu, Val, Trp, Ser, Thr, or His;
- Xaa at position 69 is Gln, Ala, Pro, Thr, Arg, Trp, Gly, or Leu;
- 15 Xaa at position 70 is Asn, Leu, Val, Trp, Pro, or Ala;
- Xaa at position 71 is Ala, Met, Leu, Arg, Glu, Thr, Gln, Trp, or Asn;
- Xaa at position 72 is Ser, Glu, Met, Ala, His, Asn, Arg, or Asp;
- Xaa at position 73 is Ala, Glu, Asp, Leu, Ser, Gly, Thr, or Arg;
- 20 Xaa at position 74 is Ile, Thr, Pro, Arg, Gly, Ala;
- Xaa at position 75 is Glu, Lys, Gly, Asp, Pro, Trp, Arg, Ser, or Leu;
- Xaa at position 76 is Ser, Val, Ala, Asn, Trp, Glu, Pro, Gly, or Asp;
- 25 Xaa at position 77 is Ile, Ser, Arg, or Thr;
- Xaa at position 78 is Leu, Ala, Ser, Glu, Gly, or Arg;
- Xaa at position 79 is Lys, Thr, Gly, Asn, Met, Ile, or Asp;
- Xaa at position 80 is Asn, Trp, Val, Gly, Thr, Leu, or Arg;
- 30 Xaa at position 81 is Leu, Gln, Gly, Ala, Trp, Arg, or Lys;
- Xaa at position 82 is Leu, Gln, Lys, Trp, Arg, or Asp;
- Xaa at position 83 is Pro, Thr, Trp, Arg, or Met;
- Xaa at position 84 is Cys, Glu, Gly, Arg, Met, or Val;
- Xaa at position 85 is Leu, Asn, or Gln;
- 35 Xaa at position 86 is Pro, Cys, Arg, Ala, or Lys;
- Xaa at position 87 is Leu, Ser, Trp, or Gly;

- Xaa at position 88 is Ala, Lys, Arg, Val, or Trp;
Xaa at position 89 is Thr, Asp, Cys, Leu, Val, Glu, His, or Asn;
Xaa at position 90 is Ala, Ser, Asp, Ile, or Met;
Xaa at position 91 is Ala, Ser, Thr, Phe, Leu, Asp, or His;
5 Xaa at position 92 is Pro, Phe, Arg, Ser, Lys, His, or Leu;
Xaa at position 93 is Thr, Asp, Ser, Asn, Pro, Ala, Leu, or Arg;
Xaa at position 94 is Arg, Ile, Ser, Glu, Leu, Val, or Pro;
Xaa at position 95 is His, Gln, Pro, Val, Leu, Thr or Tyr;
Xaa at position 96 is Pro, Lys, Tyr, Gly, Ile, or Thr;
10 Xaa at position 97 is Ile, Lys, Ala, or Asn;
Xaa at position 98 is His, Ile, Asn, Leu, Asp, Ala, Thr, or Pro;
Xaa at position 99 is Ile, Arg, Asp, Pro, Gln, Gly, Phe, or His;
Xaa at position 100 is Lys, Tyr, Leu, His, Ile, Ser, Gln, or Pro;
Xaa at position 101 is Asp, Pro, Met, Lys, His, Thr, Val, Tyr, or
15 Gln;
Xaa at position 102 is Gly, Leu, Glu, Lys, Ser, Tyr, or Pro;
Xaa at position 103 is Asp, or Ser;
Xaa at position 104 is Trp, Val, Cys, Tyr, Thr, Met, Pro, Leu,
Gln, Lys, Ala, Phe, or Gly;
20 Xaa at position 105 is Asn, Pro, Ala, Phe, Ser, Trp, Gln, Tyr,
Leu, Lys, Ile, or His;
Xaa at position 106 is Glu, Ser, Ala, Lys, Thr, Ile, Gly, or Pro;
Xaa at position 108 is Arg, Asp, Leu, Thr, Ile, or Pro;
Xaa at position 109 is Arg, Thr, Pro, Glu, Tyr, Leu, Ser, or Gly.
25

12. The human interleukin-3 mutant polypeptide of
claim 7:

wherein;

- 30 Xaa at position 28 is Gly, Asp, Ser, Ile, Leu, Met, Tyr, or Ala;
Xaa at position 31 is Gln, Val, Met or Asn;
Xaa at position 32 is Asp, Ser, Ala, Gln, His or Val;
Xaa at position 36 is Glu or Asp;
Xaa at position 37 is Asn, Pro or Thr;
35 Xaa at position 48 is Asn or Pro;
Xaa at position 62 is Ser, or Pro;

Xaa at position 68 is Leu, Trp, Asp, Asn Glu, His, Phe, Ser or Tyr;

Xaa at position 81 is His, Arg, Thr, Asn or Ser;

Xaa at position 84 is His, Ile, Leu, Ala, Arg, Gln, Lys, Met,

5 Ser,

Tyr or Val;

Xaa at position 86 is Lys or Arg;

Xaa at position 87 is Asp, Pro, His, Asn, Ile or Leu;

Xaa at position 91 is Asn, or Pro;

10 Xaa at position 94 is Arg, Ala, or Ser;

Xaa at position 102 is Lys, Val, Trp, Ala, His, Phe, or Tyr;

Xaa at position 107 is Ala, or Ile;

Xaa at position 108 is Gln, or Ile; and

Xaa at position 109 is Ala, Met or Glu.

15

13. A polypeptide of the formula

	1		5		10	
	(Met) _m -Ala	Pro	Met	Thr	Gln	Thr Thr Ser Leu Lys Thr
20		15		20		
	Ser	Trp	Val	Asn	Cys	Ser Xaa Xaa Xaa Asp Glu Ile Ile
25			30		35	
	Xaa	His	Leu	Lys	Xaa	Pro Pro Xaa Pro Xaa Leu Asp Xaa
		40		45		50
25	Xaa	Asn	Leu	Asn	Xaa	Glu Asp Xaa Asp Ile Leu Xaa Glu
		55		60		
	Xaa	Asn	Leu	Arg	Xaa	Xaa Asn Leu Xaa Xaa Phe Xaa Xaa
		65		70		75
	Ala	Xaa	Lys	Xaa	Leu	Xaa Asn Ala Ser Xaa Ile Glu Xaa
30		80		85		
	Ile	Leu	Xaa	Asn	Leu	Xaa Pro Cys Xaa Pro Xaa Xaa Thr
		90		95		100
	Ala	Xaa	Pro	Xaa	Arg	Xaa Pro Ile Xaa Ile Xaa Xaa Gly
		105		110		115
35	Asp	Trp	Xaa	Glu	Phe	Arg Xaa Lys Leu Xaa Phe Tyr Leu
		120		125		

Xaa Xaa Leu Glu Xaa Ala Gln Xaa Gln Gln Thr Thr Leu
130

Ser Leu Ala Ile Phe [SEQ ID NO:129]

- 5 wherein m is 0 or 1; Xaa at position 18 is Asn or Ile;
Xaa at position 19 is Met, Ala or Ile; Xaa at position
20 is Ile, Pro or Ile; Xaa at position 23 is Ile, Ala
or Leu; Xaa at position 25 is Thr or His; Xaa at
position 29 is Gln, Arg, Val or Ile; Xaa at position
10 32 is Leu, Ala, Asn or Arg; Xaa at position 34 is Leu
or Ser; Xaa at position 37 is Phe, Pro, or Ser; Xaa at
position 38 is Asn or Ala; Xaa at position 42 is Gly,
Ala, Ser, Asp or Asn; Xaa at position 45 is Gln, Val,
or Met; Xaa at position 46 is Asp or Ser; Xaa at
15 position 49 is Met, Ile, Leu or Asp; Xaa at position
50 is Glu or Asp; Xaa at position 51 is Asn Arg or
Ser; Xaa at position 55 is Arg, Leu, or Thr; Xaa at
position 56 is Pro or Ser; Xaa at position 59 is Glu
or Leu; Xaa at position 60 is Ala or Ser; Xaa at
20 position 62 is Asn, Val or Pro; Xaa at position 63 is
Arg or His; Xaa at position 65 is Val or Ser; Xaa at
position 67 is Ser, Asn, His or Gln; Xaa at position
69 is Gln or Glu; Xaa at position 73 is Ala or Gly;
Xaa at position 76 is Ser, Ala or Pro; Xaa at position
25 79 is Lys, Arg or Ser; Xaa at position 82 is Leu, Glu,
Val or Trp; Xaa at position 85 is Leu or Val; Xaa at
position 87 is Leu, Ser, Tyr; Xaa at position 88 is
Ala or Trp; Xaa at position 91 is Ala or Pro; Xaa at
position 93 is Pro or Ser; Xaa at position 95 is His
30 or Thr; Xaa at position 98 is His, Ile, or Thr; Xaa at
position 100 is Lys or Arg; Xaa at position 101 is
Asp, Ala or Met; Xaa at position 105 is Asn or Glu;
Xaa at position 109 is Arg, Glu or Leu; Xaa at
position 112 is Thr or Gln; Xaa at position 116 is
35 Lys, Val, Trp or Ser; Xaa at position 117 is Thr or
Ser; Xaa at position 120 is Asn, Gln, or His; Xaa at

position 123 is Ala or Glu; with the proviso that from
four to forty-four of the amino acids designated by
Xaa are different from the corresponding amino acids
of native human interleukin-3; or a polypeptide having
5 substantially the same structure and substantially the
same biological activity.

14. A polypeptide according to Claim 13
wherein Xaa at position 18 is Ile; Xaa at position 19
10 is Ala, or Ile; Xaa at position 20 is Pro, or Leu; Xaa
at position 23 is Ala, or Leu; Xaa at position 25 is
His; Xaa at position 29 is Arg, Val, or Ile; Xaa at
position 32 is Ala, Asn or Arg; Xaa at position 34 is
Ser; Xaa at position 37 is Pro or Ser; Xaa at position
15 38 is Ala; Xaa at position 42 is Ala, Ser, Asp, or
Asn; and Xaa at position 45 is Val or Met; Xaa at
position 46 is Ser.

15. A polypeptide according to Claim 13
20 wherein Xaa at position 49 is Ile, or Leu, or Asp; Xaa
at position 50 is Asp; Xaa at position 51 is Arg or
Ser; Xaa at position 55 is Leu or Thr; Xaa at position
56 is Ser; Xaa at position 59 is Glu or Leu; Xaa at
position 60 is Ala or Ser; Xaa at position 62 is Val,
25 or Pro; Xaa at position 63 is His; Xaa at position 65
is Ser; Xaa at position 67 is Asn, or His, or Gln; and
Xaa at position 69 is Glu.

30 16. A polypeptide according to Claim 13
wherein Xaa at position 73 is Gly; Xaa at position 76
is Ala, or Pro; Xaa at position 79 is Arg, or Ser; Xaa
at position 82 is Gln or Val, or Trp; Xaa at position
85 is Val; Xaa at position 87 is Ser, or Tyr; Xaa at
35 position 88 is Trp; Xaa at position 91 is Pro; Xaa at
position 93 is Ser; Xaa at position 95 is Thr; Xaa at

position 98 is Ile or Thr; Xaa at position 100 is Arg; Xaa at position 101 is Ala, or Met; and Xaa at position 105 is Glu.

5 17. A polypeptide according to Claim 13
wherein Xaa at position 109 is Glu, or Leu; Xaa at
position 112 is Gln; Xaa at position 116 is Val, or
Trp, or Ser; Xaa at position 117 is Ser; Xaa at
position 120 is Glu or His; and Xaa at position 123 is
10 Glu.

 18. A polypeptide according to Claim 13
wherein Xaa at position 18 is Ile; Xaa at position 19
is Ala, or Ile; Xaa at position 20 is Pro, or Leu; Xaa
15 at position 23 is Ala, or Leu; Xaa at position 25 is
His; Xaa at position 29 is Arg or Val, or Ile; Xaa at
position 32 is Ala or Asn, or Arg; Xaa at position 34
is Ser; Xaa at position 37 is Pro or Ser; Xaa at
position 38 is Ala; Xaa at position 42 is Ala or Ser,
20 Asp or Asn; Xaa at position 45 is Val or Met; Xaa at
position 46 is Ser; Xaa at position 49 is Ile, or Leu,
or Asp; Xaa at position 50 is Asp; Xaa at position 51
is Arg, or Ser; Xaa at position 55 is Leu or Thr; Xaa
at position 56 is Ser; Xaa at position 59 is Glu or
25 Leu; Xaa at position 60 is Ala or Ser; Xaa at position
62 is Val, or Pro; Xaa at position 63 is His; Xaa at
position 65 is Ser; Xaa at position 67 is Asn, or His,
or Gln; and Xaa at position 69 is Glu.

30 19. A polypeptide according to Claim 13
wherein Xaa at position 73 is Gly; Xaa at position 76
is Ala, or Pro; Xaa at position 79 is Arg, or Ser; Xaa
at position 82 is Gln or Val, or Trp; Xaa at position
85 is Val; Xaa at position 87 is Ser, or Tyr; Xaa at
35 position 88 is Trp; Xaa at position 91 is Pro; Xaa at
position 93 is Ser; Xaa at position 95 is Thr; Xaa at

30 wherein m is 0 or 1; n is 0 or 1; p is 0 or 1; Xaa at
position 4 is Asn or Ile; Xaa at position 5 is Met,
Ala or Ile; Xaa at position 6 is Ile, Pro or Leu; Xaa
at position 9 is Ile, Ala or Leu; Xaa at position 11
35 is Thr or His; Xaa at position 15 is Gln, Arg, Val or
Ile; Xaa at position 18 is Leu, Ala, Asn or Arg; Xaa

at position 20 is Leu or Ser; Xaa at position 23 is Phe, Pro, or Ser; Xaa at position 24 is Asn or Ala; Xaa at position 28 is Gly, Ala, Ser, Asp or Asn; Xaa at position 31 is Gln, Val, or Met; Xaa at position 32 is Asp or Ser; Xaa at position 35 is Met, Ile or Asp; Xaa at position 36 is Glu or Asp; Xaa at position 37 is Asn, Arg or Ser; Xaa at position 41 is Arg, Leu, or Thr; Xaa at position 42 is Pro or Ser; Xaa at position 45 is Glu or Leu; Xaa at position 46 is Ala or Ser; Xaa at position 48 is Asn, Val or Pro; Xaa at position 49 is Arg or His; Xaa at position 51 is Val or Ser; Xaa at position 53 is Ser, Asn, His or Gln; Xaa at position 55 is Gln or Glu; Xaa at position 59 is Ala or Gly; Xaa at position 62 is Ser, Ala or Pro; Xaa at position 65 is Lys, Arg or Ser; Xaa at position 67 is Leu, Glu, or Val; Xaa at position 68 is Leu, Glu, Val or Trp; Xaa at position 71 is Leu or Val; Xaa at position 73 is Leu, Ser or Tyr; Xaa at position 74 is Ala or Trp; Xaa at position 77 is Ala or Pro; Xaa at position 79 is Pro or Ser; Xaa at position 81 is His or Thr; Xaa at position 84 is His, Ile, or Thr; Xaa at position 86 is Lys or Arg; Xaa at position 87 is Asp, Ala or Met; Xaa at position 91 is Asn or Glu; Xaa at position 95 is Arg, Glu, Leu; Xaa at position 98 Thr or Gln; Xaa at position 102 is Lys, Val, Trp or Ser; Xaa at position 103 is Thr or Ser; Xaa at position 106 is Asn, Gln, or His; Xaa at position 109 is Ala or Glu; with the proviso that from four to forty-four of the amino acids designated by Xaa are different from the corresponding amino acids of native (15-125)human interleukin-3; or a polypeptide having substantially the same structure and substantially the same biological activity.

35 21. A polypeptide according to Claim 20
wherein Xaa at position 4 is Ile; Xaa at position 5 is

Ala, or Ile; Xaa at position 6 is Pro, or Leu; Xaa at position 9 is Ala, or Leu; Xaa at position 11 is His; Xaa at position 15 is Arg or Val, or Ile; Xaa at position 18 is Ala or Asn, or Arg; Xaa at position 20 is Ser; Xaa at position 23 is Pro or Ser; Xaa at position 24 is Ala; Xaa at position 28 is Ala or Ser, or Asp, or Asn; Xaa at position 31 is Val or Met; and Xaa at position 32 is Ser.

22. A polypeptide according to Claim 20 wherein Xaa at position 35 is Ile, or Leu, or Asp; Xaa at position 36 is Asp; Xaa at position 37 is Arg, or Ser; Xaa at position 41 is Leu or Thr; Xaa at position 42 is Ser; Xaa at position 45 is Glu or Leu; Xaa at position 46 is Ala or Ser; Xaa at position 48 is Val, or Pro; Xaa at position 49 is His; Xaa at position 51 is Ser; Xaa at position 53 is Asn, or His, or Gln; and Xaa at position 55 is Glu.

23. A polypeptide according to Claim 20 wherein Xaa at position 59 is Gly; Xaa at position 62 is Ala, or Pro; Xaa at position 65 is Arg, or Ser; Xaa at position 67 is Gln or Val; Xaa at position 68 is Glu, or Val, or Trp; Xaa at position 71 is Val; Xaa at position 73 is Ser, or Tyr; Xaa at position 74 is Trp; Xaa at position 77 is Pro; Xaa at position 79 is Ser; Xaa at position 81 is Thr; Xaa at position 84 is Ile or Thr; Xaa at position 86 is Arg; Xaa at position 87 is Ala, or Met; and Xaa at position 91 is Glu.

24. A polypeptide according to Claim 20 wherein Xaa at position 95 is Glu, or Leu; Xaa at position 98 is Gln; Xaa at position 102 is Val, or Trp, or Ser; Xaa at position 103 is Ser; Xaa at position 106 is Glu or His; and Xaa at position 109 is Glu.

25. A polypeptide according to Claim 20
 wherein Xaa at position 4 is Ile; Xaa at position 5 is
 Ala, or Ile; Xaa at position 6 is Pro, or Leu; Xaa at
 5 position 9 is Ala, or Leu; Xaa at position 11 is His;
 Xaa at position 15 is Arg or Val, or Ile; Xaa at
 position 18 is Ala or Asn, or Arg; Xaa at position 20
 is Ser; Xaa at position 23 is Pro or Ser; Xaa at
 position 24 is Ala; Xaa at position 28 is Ala or Ser,
 10 or Asp, or Asn; Xaa at position 31 is Val or Met; Xaa
 at position 32 is Ser; Xaa at position 35 is Ile, or
 Leu, or Asp; Xaa at position 36 is Asp; Xaa at
 position 37 is Arg, or Ser; Xaa at position 41 is Leu
 or Thr; Xaa at position 42 is Ser; Xaa at position 45
 15 is Glu or Leu; Xaa at position 46 is Ala or Ser; Xaa
 at position 48 is Val, or Pro; Xaa at position 49 is
 His; Xaa at position 51 is Ser; Xaa at position 53 is
 Asn, or His, or Gln; and Xaa at position 55 is Glu.

20 26. A polypeptide according to Claim 20
 wherein Xaa at position 59 is Gly; Xaa at position 62
 is Ala, or Pro; Xaa at position 65 is Arg, or Ser; Xaa
 at position 67 is Gln or Val; Xaa at position 68 is
 Glu, or Val, or Trp; Xaa at position 71 is Val; Xaa at
 25 position 73 is Ser, or Tyr; Xaa at position 74 is Trp;
 Xaa at position 77 is Pro; Xaa at position 79 is Ser;
 Xaa at position 81 is Thr; Xaa at position 84 is Ile
 or Thr; Xaa at position 86 is Arg; Xaa at position 87
 is Ala, or Met; Xaa at position 91 is Glu; Xaa at
 30 position 95 is Glu, or Lue; Xaa at position 98 is Gln;
 Xaa at position 102 is Val, or Trp, or Ser; Xaa at
 position 103 is Ser; Xaa at position 106 is Glu or
 His; and Xaa at position 109 is Glu.

35 27. A polypeptide according to Claim 20
 which is selected from

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 Leu
 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
 Asn Ala
 5 Glu Asp Val Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
 Pro Asn
 Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
 Ala Ser
 Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
 10 Pro Leu
 Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
 Asp Gly
 Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
 Lys Thr
 15 Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:66];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 Leu Lys
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn
 20 Ser Glu
 Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
 Asn Leu
 Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
 Ser Ala
 25 Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
 Leu Ala
 Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
 Gly Asp
 Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
 30 Thr Leu
 Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:67];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 Leu Lys
 35 Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn
 Ser Glu

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    Asp Met Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
    Asn Leu
    Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
    Ser Ala
5   Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
    Leu Ala
    Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
    Gly Asp
    Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
10  Thr Leu
    Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:68];

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      Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
15  Leu Lys
    Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
    Gly Glu
    Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
    Asn Leu
    Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
20  Ser Ala
    Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
    Leu Ala
    Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
    Gly Asp
25  Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
    Thr Leu
    Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:69];

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          Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
30  Leu Lys
      Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
      Gly Glu
      Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
      Asn Leu
35  Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
      Ser Ala

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336

Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
 Leu Ala
 Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
 Gly Asp
 5 Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
 Thr Leu
 Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:70];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
 10 Leu Lys
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
 Gly Glu
 Asp Gln Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro
 Asn Leu
 15 Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala
 Ser Ala
 Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
 Leu Ala
 Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
 20 Gly Asp
 Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
 Thr Leu
 Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:71];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
 25 Leu Lys
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
 Gly Glu
 Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
 30 Asn Leu
 Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
 Ser Gly
 Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro
 Ser Ala
 35 Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala
 Gly Asp

Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
 Thr Leu
 Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:72];

5 Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
 Leu Lys
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
 Gly Glu
 Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
 10 Asn Leu
 Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
 Ser Gly
 Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
 Ser Ala
 15 Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
 Gly Asp
 Trp Gln Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
 Thr Leu
 Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:73];

20 Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
 Leu Lys
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
 Gly Glu
 25 Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
 Asn Leu
 Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
 Ser Ala
 Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
 30 Leu Ala
 Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
 Gly Asp
 Trp Asn Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
 Thr Leu
 35 Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:74];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
 Leu Lys
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
 Gly Glu
 5 Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
 Asn Leu
 Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
 Ser Ala
 Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
 10 Leu Ala
 Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
 Gly Asp
 Trp Asn Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
 Ser Leu
 15 Glu His Ala Gln Glu Gln Gln [SEQ ID NO:75];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
 Leu Lys
 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
 20 Gly Glu
 Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
 Asn Leu
 Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
 Ser Gly
 25 Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro
 Ser Ala
 Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala
 Gly Asp
 Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
 30 Thr Leu
 Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:76];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
 Leu Lys
 35 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
 Gly Glu

339

Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
 Asn Leu
 Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
 Ser Gly
 5 Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
 Ser Ala
 Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
 Gly Asp
 Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
 10 Thr Leu
 Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:77];

Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr His
 Leu Lys
 15 Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu Asn
 Gly Glu
 Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg Pro
 Asn Leu
 Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn Ala
 20 Ser Gly
 Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu Pro
 Ser Ala
 Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys Ala
 Gly Asp
 25 Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val
 Ser Leu
 Glu His Ala Gln Glu Gln Gln [SEQ ID NO:78];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 30 Leu Lys
 Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn
 Ala Glu
 Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
 Asn Leu
 35 Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
 Ser Ala

340

Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
 Leu Ala
 Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
 Gly Asp
 5 Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
 Thr Leu
 Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:79];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 10 Leu Lys
 Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn
 Ser Glu
 Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro
 Asn Leu
 15 Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn Ala
 Ser Ala
 Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
 Leu Ala
 Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
 20 Gly Asp
 Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
 Thr Leu
 Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:80];

Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His His
 25 Leu Lys
 Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu Asn
 Ser Glu
 Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro
 30 Asn Leu
 Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala
 Ser Ala
 Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu Pro
 Leu Ala
 35 Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys Asp
 Gly Asp

341

Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu Lys
 Thr Leu
 Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:81];

5 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
 His Leu
 Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
 Asn Gly
 Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
 10 Pro Asn
 Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
 Ala Ser
 Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
 Pro Ser
 15 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
 Ala Gly
 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
 Val Thr
 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:82];
 20 Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
 His Leu
 Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
 Asn Gly
 25 Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
 Pro Asn
 Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
 Ala Ser
 Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
 30 Pro Ser
 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
 Ala Gly
 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
 Val Thr
 35 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:83];

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Met Ala Asn Cys Ser Asn Met Ile Asp Glu Ile Ile Thr
His Leu
Lys Gln Pro Pro Leu Pro Leu Leu Asp Phe Asn Asn Leu
Asn Gly
5 Glu Asp Gln Asp Ile Leu Met Glu Asn Asn Leu Arg Arg
Pro Asn
Leu Glu Ala Phe Asn Arg Ala Val Lys Ser Leu Gln Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
10 Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Ser
15 Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:84];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
20 Asn Ala
Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
25 Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
Pro Leu
Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
Asp Gly
Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
30 Lys Thr
Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:85];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
35 Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser

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343

Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
 Pro Asn
 Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
 Ala Ser
 5 Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
 Pro Leu
 Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
 Asp Gly
 Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
 10 Lys Thr
 Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:86];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
 His Leu
 15 Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
 Asn Ser
 Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
 Pro Asn
 Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
 20 Ala Ser
 Ala Ile Glu Ser Ile Leu Lys Asn Leu Leu Pro Cys Leu
 Pro Leu
 Ala Thr Ala Ala Pro Thr Arg His Pro Ile His Ile Lys
 Asp Gly
 25 Asp Trp Asn Glu Phe Arg Arg Lys Leu Thr Phe Tyr Leu
 Lys Thr
 Leu Glu Asn Ala Gln Ala Gln Gln [SEQ ID NO:87];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
 30 His Leu
 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
 Asn Ala
 Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
 Pro Asn
 35 Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
 Ala Ser

344

Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly
5 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:88];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
10 His Leu
Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn
15 Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
20 Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:89];

25 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
30 Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
35 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

345

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:90];

5 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ala
Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
10 Pro Asn
Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
Pro Ser
15 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:91];

20 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
Asn Ser
25 Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
30 Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
35 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:92];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser
5 Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
10 Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Ser
15 Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:93];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Val Pro Pro Ala Pro Leu Leu Asp Ser Asn Asn Leu
20 Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser
25 Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
Pro Ser
Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
30 Val Ser
Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:94];

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
35 Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser

347

Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
 Pro Asn
 Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
 Ala Ser
 5 Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
 Pro Ser
 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
 Ala Gly
 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
 10 Val Thr
 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:95]; and

 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
 His Leu
 15 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
 Asn Ala
 Glu Asp Val Asp Ile Leu Met Glu Arg Asn Leu Arg Leu
 Pro Asn
 Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
 20 Ala Ser
 Gly Ile Glu Ala Ile Leu Arg Asn Leu Val Pro Cys Leu
 Pro Ser
 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Thr Ile Lys
 Ala Gly
 25 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
 Val Ser
 Leu Glu His Ala Gln Glu Gln Gln [SEQ ID NO:96].

 30 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
 His Leu
 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
 Asn Ala
 35 Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu
 Ser Asn
 Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
 40 Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

5 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

10 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 296]

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ala Ile His
His Leu

15 Lys Arg Pro Pro Ala Pro Ser Leu Asp Pro Asn Asn Leu
Asn Asp

Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
20 Pro Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser

25 Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

30 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 300]

35

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

40 Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp

Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
45 Pro Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser

50 Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu

349

Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

5 Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 301]

10 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
15 Asn Ala

Glu Asp Val Asp Ile Leu Met Asp Arg Asn Leu Arg Leu
Pro Asn

20 Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

25 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
30 Val Thr

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 308]

35 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu

Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp

40 Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
45 Ala Ser

Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

50 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys

350

Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

5 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 309]

Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
10 His Leu

Lys Arg Pro Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu
Asn Asp

15 Glu Asp Met Ser Ile Leu Met Glu Arg Asn Leu Arg Leu
Pro Asn

Leu Glu Ser Phe Val Arg Ala Val Lys Asn Leu Glu Asn
Ala Ser

20 Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser

Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
25 Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

30 Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 310]

Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp
Lys Asn

35 Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
Arg Pro

Pro Ala Pro Leu Leu Asp Pro Asn Asn Leu Asn Ala Glu
Asp Val

40 Asp Ile Leu Met Glu Arg Asn Leu Arg Leu Pro Asn Leu
Glu Ser

Phe Val Arg Ala Val Lys Asn Leu Glu Asn Ala Ser Gly
45 Ile Glu

Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala
Thr Ala

50 Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp

351

Trp Gln
 Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu
 Glu Gln
 5 Ala Gln Glu Gln Gln [SEQ ID NO.: 315]
 Met Ala Tyr Pro Glu Thr Asp Tyr Lys Asp Asp Asp Asp
 10 Lys Asn
 Cys Ser Ile Met Ile Asp Glu Ile Ile His His Leu Lys
 Arg Pro
 15 Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu Asn Ser Glu
 Asp Met
 Asp Ile Leu Met Glu Arg Asn Leu Arg Thr Pro Asn Leu
 Leu Ala
 20 Phe Val Arg Ala Val Lys His Leu Glu Asn Ala Ser Gly
 Ile Glu
 Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu Pro Ser Ala
 25 Thr Ala
 Ala Pro Ser Arg His Pro Ile Ile Ile Lys Ala Gly Asp
 Trp Gln
 30 Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu Val Thr Leu
 Glu Gln
 Ala Gln Glu Gln Gln [SEQ ID NO.: 316]
 35 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Leu Ile His
 His Leu
 Lys Ile Pro Pro Asn Pro Ser Leu Asp Ser Ala Asn Leu
 Asn Ser
 40 Glu Asp Val Ser Ile Leu Met Glu Arg Asn Leu Arg Thr
 Pro Asn
 Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
 45 Ala Ser
 Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
 Pro Ser
 50 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys

Ala Gly

Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr

5

Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO.: 318]

28. A pharmaceutical composition for the
treatment of hematopoietic cell deficiencies
10 comprising a therapeutically effective amount of a
mutant human interleukin-3 polypeptide selected from
the group consisting of a polypeptide of claim 1, a
polypeptide of claim 2, a polypeptide of claim 3, a
polypeptide of claim 4, a polypeptide of claim 5, a
15 polypeptide of claim 6, a polypeptide of claim 7, a
polypeptide of claim 8, a polypeptide of claim 9, a
polypeptide of claim 10, a polypeptide of claim 11, a
polypeptide of claim 12, a polypeptide of claim 13, a
polypeptide of claim 14, a polypeptide of claim 15, a
20 polypeptide of claim 16, a polypeptide of claim 17; a
polypeptide of claim 18, a polypeptide of claim 19, a
polypeptide of claim 20, a polypeptide of claim 21, a
polypeptide of claim 22, a polypeptide of claim 23, a
polypeptide of claim 24, a polypeptide of claim 25, a
25 polypeptide of claim 26 and a polypeptide of claim 27,
and a pharmaceutically acceptable carrier.

29. A pharmaceutical composition according
30 to Claim 28 for the treatment of hematopoietic cell
deficiencies comprising a therapeutically effective
amount of a polypeptide having an amino acid sequence
corresponding to SEQ ID NO:88 and a pharmaceutically
acceptable carrier.

35

30. A pharmaceutical composition according
to Claim 28 for the treatment of hematopoietic cell
deficiencies comprising a therapeutically effective

amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89 and a pharmaceutically acceptable carrier.

5 31. A pharmaceutical composition according to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:90 and a pharmaceutically
10 acceptable carrier.

 32. A pharmaceutical composition according to Claim 28 for the treatment of hematopoietic cell deficiencies comprising a therapeutically effective
15 amount of a polypeptide selected from the group consisting of

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:66;

20 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:67;

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:68;

25 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:69;

30 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:70;

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:71;

35 a polypeptide having an amino acid sequence corresponding

354

to SEQ ID NO:72;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:73;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:74;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:75;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:76;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:77;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:78;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:79;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:80;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:81;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:82;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:83;

35

a polypeptide having an amino acid sequence corresponding

355

to SEQ ID NO:84;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:85;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:86;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:87;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:91;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:92;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:93;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:94;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:95;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:96;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:258;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:259;

35

a polypeptide having an amino acid sequence corresponding

356

to SEQ ID NO:260;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:261;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:262;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:263;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:278;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:279;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:315;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:316;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:264;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:265;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:266;

35

a polypeptide having an amino acid sequence corresponding

357

to SEQ ID NO:267;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:268;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:269;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:270;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:271;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:272;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:273;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:274;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:275;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:276;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:277;

35

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:280;

358

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:281;

a polypeptide having an amino acid sequence corresponding
5 to SEQ ID NO:282;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:283;

10 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:284;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:285;

15 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:286;

a polypeptide having an amino acid sequence corresponding
20 to SEQ ID NO:287;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:288;

25 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:289;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:299;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:300;

35 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:301;

- a polypeptide having an amino acid sequence corresponding to SEQ ID NO:302;
- 5 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:303;
- a polypeptide having an amino acid sequence corresponding to SEQ ID NO:304;
- 10 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:305;
- a polypeptide having an amino acid sequence corresponding to SEQ ID NO:306;
- 15 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:307;
- a polypeptide having an amino acid sequence corresponding to SEQ ID NO:308;
- 20 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:309;
- a polypeptide having an amino acid sequence corresponding to SEQ ID NO:310;
- 25 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:311;
- 30 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:312;
- 35 a polypeptide having an amino acid sequence corresponding

360

to SEQ ID NO:313;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:317;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:318;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:319;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:320;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:321;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:322;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:323;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:324;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:325;

35

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:326;

and a pharmaceutically acceptable carrier.

33. A method of stimulating the production of hematopoietic cells which comprises administering a therapeutically effective amount of a mutant human interleukin-3 polypeptide selected from the group consisting of a polypeptide of claim 1, a polypeptide of claim 2, a polypeptide of claim 3, a polypeptide of claim 4, a polypeptide of claim 5, a polypeptide of claim 6, a polypeptide of claim 7, a polypeptide of claim 8, a polypeptide of claim 9, a polypeptide of claim 10, a polypeptide of claim 11, a polypeptide of claim 12, a polypeptide of claim 13, a polypeptide of claim 14, a polypeptide of claim 15, a polypeptide of claim 16, a polypeptide of claim 17; a polypeptide of claim 18, a polypeptide of claim 19, a polypeptide of claim 20, a polypeptide of claim 21, a polypeptide of claim 22, a polypeptide of claim 23, a polypeptide of claim 24, a polypeptide of claim 25, a polypeptide of claim 26, a polypeptide of claim 27, to a patient in need of such treatment.

20

34. A method according to claim 33 of stimulating the production of hematopoietic cells which comprises administering a therapeutically effective amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:88.

25

35. A method according to claim 33 of stimulating the production of hematopoietic cells which comprises administering a therapeutically effective amount of a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89.

30

36. A method according to claim 33 of stimulating the production of hematopoietic cells which comprises administering a therapeutically effective amount of a polypeptide having an amino acid

35

363

to SEQ ID NO:75;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:76;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:77;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:78;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:79;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:80;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:81;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:82;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:83;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:84;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:85;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:86;

35

a polypeptide having an amino acid sequence corresponding

364

to SEQ ID NO:87;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:91;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:92;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:93;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:94;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:95;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:96;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:258;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:259;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:260;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:261;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:262;

35

a polypeptide having an amino acid sequence corresponding

365

to SEQ ID NO:263;

5 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:278;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:279;

10 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:315;

15 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:316;

20 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:264;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:265;

25 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:266;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:267;

30 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:268;

35 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:269;

366

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:270;

5 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:271;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:272;

10 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:273;

15 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:274;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:275;

20 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:276;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:277;

25 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:280;

30 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:281;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:282;

35 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:283;

367

- a polypeptide having an amino acid sequence corresponding to SEQ ID NO:284;
- 5 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:285;
- 10 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:286;
- a polypeptide having an amino acid sequence corresponding to SEQ ID NO:287;
- 15 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:288;
- a polypeptide having an amino acid sequence corresponding to SEQ ID NO:289;
- 20 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:299;
- a polypeptide having an amino acid sequence corresponding to SEQ ID NO:300;
- 25 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:301;
- 30 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:302;
- a polypeptide having an amino acid sequence corresponding to SEQ ID NO:303;
- 35 a polypeptide having an amino acid sequence corresponding

368

to SEQ ID NO:304;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:305;

5

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:306;

10

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:307;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:308;

15

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:309;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:310;

20

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:311;

25

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:312;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:313;

30

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:314;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:317;

35

369

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:318;

5 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:319;

10 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:320;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:321;

15 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:322;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:323;

20 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:324;

a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:325;

25 a polypeptide having an amino acid sequence corresponding
to SEQ ID NO:326;

to a patient in need of such treatment.

30

38. A recombinant DNA sequence comprising
vector DNA and a DNA that encodes a polypeptide selected
from the group consisting of a polypeptide of claim 1, a
polypeptide of claim 2, a polypeptide of claim 3, a polypeptide
35 of claim 4, a polypeptide of claim 5, a polypeptide of claim 6, a
polypeptide of claim 7, a polypeptide of claim 8, a polypeptide

of claim 9, a polypeptide of claim 10, a polypeptide of claim 11,
a polypeptide of claim 12, a polypeptide of claim 13, a
polypeptide of claim 14, a polypeptide of claim 15, a polypeptide
of claim 16, a polypeptide of claim 17; a polypeptide of claim
5 18, a polypeptide of claim 19, a polypeptide of claim 20, a
polypeptide of claim 21, a polypeptide of claim 22, a polypeptide
of claim 23, a polypeptide of claim 24, a polypeptide of claim
25, a polypeptide of claim 26, or a polypeptide of claim 27,.

10 39. A recombinant DNA sequence according to
Claim 38 comprising vector DNA and a DNA having a
nucleotide sequence corresponding to SEQ ID NO:97.

15 40. A recombinant DNA sequence according to
Claim 38 comprising vector DNA and a DNA having a
nucleotide sequence corresponding to SEQ ID NO:100 or
103.

20 41. A recombinant DNA sequence according to
Claim 38 comprising vector DNA and a DNA having a
nucleotide sequence corresponding to SEQ ID NO:161.

25 42. A recombinant DNA sequence according to
Claim 38 comprising vector DNA and a DNA selected from

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:98;

30 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:99;

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:101;

35 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:102;

- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:104;
- 5 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:105;
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:106;
- 10
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:107;
- 15 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:108;
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:109;
- 20 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:110;
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:111;
- 25 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:112;
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:113;
- 30 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:114;
- 35 a DNA having a nucleotide sequence corresponding to SEQ ID

NO:115;

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:116;

5

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:117;

10

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:118;

15

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:119;

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:120;

20

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:121;

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:122;

25

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:123;

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:124;

30

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:125;

35

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:126;

374

- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:334
- 5 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:335
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:336
- 10 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:337
- 15 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:338
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:339
- 20 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:340
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:341
- 25 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:342
- 30 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:343
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:344
- 35 a DNA having a nucleotide sequence corresponding to SEQ ID

375

NO:345

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:348

5

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:349

10

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:350

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:352

15

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:353

20

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:354

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:355

25

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:356

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:357

30

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:358

35

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:359

376

- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:360
- 5 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:361
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:362
- 10 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:363
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:364
- 15 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:365
- 20 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:366
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:367
- 25 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:368
- a DNA having a nucleotide sequence corresponding to SEQ ID
NO:369
- 30 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:370
- 35 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:371

377

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:372

5 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:373

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:374

10 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:375

15 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:376

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:377

20 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:378

25 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:379

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:380

30 a DNA having a nucleotide sequence corresponding to SEQ ID
NO:381

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:382

35 a DNA having a nucleotide sequence corresponding to SEQ ID

378

NO:384

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:385

5

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:386

10

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:387

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:388

15

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:389

20

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:390

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:391

25

a DNA having a nucleotide sequence corresponding to SEQ ID
NO:392

43. A host cell containing a recombinant
30 DNA sequence of claim 38 and capable of expressing the
encoded polypeptide.

44. A host cell of claim 43 containing a
recombinant DNA vector comprising vector DNA and a DNA
35 having a nucleotide sequence corresponding to SEQ ID
NO:97 and capable of expressing the encoded

polypeptide.

45. A host cell of claim 43 containing a recombinant DNA vector comprising vector DNA and a DNA
5 having a nucleotide sequence corresponding to SEQ ID NO:100 or 103 and capable of expressing the encoded polypeptide.

46. A host cell of claim 43 containing a
10 recombinant DNA vector comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:161 and capable of expressing the encoded polypeptide.

15 47. A method of producing a mutant human interleukin-3 polypeptide comprising the steps of:

(a) culturing a host cell containing a recombinant DNA sequence comprising vector DNA
20 and a DNA sequence of Claim 38 and capable of expressing the encoded polypeptide under conditions permitting expression of the recombinant DNA; and

25 (b) harvesting the polypeptide from the culture.

48. A method according to Claim 47 of producing a mutant human interleukin-3 polypeptide comprising the steps of:

30 (a) culturing a host cell containing a recombinant DNA sequence comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:97 and capable of
35 expressing the encoded polypeptide under conditions permitting expression of the

recombinant DNA; and

(b) harvesting the polypeptide from the culture.

5 49. A method according to Claim 47 of
producing a mutant human interleukin-3 polypeptide
comprising the steps of:

10 (a) culturing a host cell containing a
recombinant DNA sequence comprising vector DNA
and a DNA having a nucleotide sequence
corresponding to SEQ ID NO:100 or 103 and capable
of expressing the encoded polypeptide under
conditions permitting expression of the
15 recombinant DNA; and

(b) harvesting the polypeptide from the culture.

20 50. A method according to Claim 47 of
producing a mutant human interleukin-3 polypeptide
comprising the steps of:

25 (a) culturing a host cell containing a
recombinant DNA sequence comprising vector DNA
and a DNA having a nucleotide sequence
corresponding to SEQ ID NO:161 and capable of
expressing the encoded polypeptide under
conditions permitting expression of the
recombinant DNA; and

30

(b) harvesting the polypeptide from the culture.

51. A vector containing a gene having a DNA
sequence selected from the group consisting of:

35

a DNA having a nucleotide sequence corresponding

381

to SEQ ID NO:97;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:100;

5

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:103;

10

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:160;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:161;

15

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:404;

20

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:405;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:364;

25

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:368;

30

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:369;

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:376;

35

a DNA having a nucleotide sequence corresponding
to SEQ ID NO:377;

a DNA having a nucleotide sequence corresponding to SEQ ID NO:378;

5

a DNA having a nucleotide sequence corresponding to SEQ ID NO:385;

10 52. A recombinant DNA vector comprising a promoter, a ribosome binding site, and a signal peptide directly linked to a DNA sequence encoding a polypeptide selected from the group consisting of

15 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:88;

a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89; and

20 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:90;

said vector being capable of directing expression of said mutant human interleukin-3 polypeptide.

25

53. A recombinant DNA vector according to Claim 51 wherein the promoter is AraBAD.

30 54. A recombinant DNA vector according to Claim 51 wherein the ribosome binding site is g10-L.

55. A recombinant DNA vector according to Claim 51 wherein the signal peptide is a lamB signal peptide.

35

56. A recombinant DNA vector according to

Claim 51 wherein the signal peptide is the lamB signal peptide depicted in Figure 8.

5 57. A recombinant DNA vector according to Claim 51 wherein the promoter is AraBAD and the ribosome binding site is gl0-L.

10 58. A recombinant DNA vector according to Claim 51 wherein the promoter is AraBAD, the ribosome binding site is gl0-L, and the signal peptide is a lamB signal peptide.

15 59. A recombinant DNA vector according to Claim 51 wherein the promoter is AraBAD, the ribosome binding site is gl0-L, and the signal peptide is the lamB signal peptide depicted in Figure 8.

20 60. A recombinant bacterial host which comprises the vector of Claim 51 wherein said host secretes a mutant human interleukin-3 polypeptide selected from the group consisting of

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:88;

25

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:89; and

30

 a polypeptide having an amino acid sequence corresponding to SEQ ID NO:90.

 61. A polypeptide of the formula

 1 5 10
(Met)_m-Ala Pro Met Thr Gln Thr Thr Ser Leu Lys Thr

35

15

20

384

Ser Trp Val Asn Cys Ser Xaa Met Ile Asp Glu Ile Ile
 25 30 35
 Xaa His Leu Lys Xaa Pro Pro Xaa Pro Leu Leu Asp Xaa
 40 45 50
 5 Asn Asn Leu Asn Xaa Glu Asp Xaa Asp Ile Leu Met Glu
 55 60
 Xaa Asn Leu Arg Xaa Pro Asn Leu Xaa Xaa Phe Xaa Arg
 65 70 75
 Ala Val Lys Xaa Leu Xaa Asn Ala Ser Xaa Ile Glu Xaa
 10 80 85
 Ile Leu Xaa Asn Leu Xaa Pro Cys Leu Pro Xaa Ala Thr
 90 95 100
 Ala Ala Pro Xaa Arg His Pro Ile Xaa Ile Lys Xaa Gly
 105 110 115
 15 Asp Trp Xaa Glu Phe Arg Xaa Lys Leu Thr Phe Tyr Leu
 120 125
 Xaa Thr Leu Glu Xaa Ala Gln Xaa Gln Gln Thr Thr Leu
 130
 Ser Leu Ala Ile Phe [SEQ ID NO:129]

20 wherein m is 0 or 1; Xaa at position 18 is Asn or Ile;
 Xaa at position 25 is Thr or His; Xaa at position 29
 is Gln, Arg, or Val; Xaa at position 32 is Leu, Ala,
 or Asn; Xaa at position 37 is Phe, Pro, or Ser; Xaa at
 25 position 42 is Glu, Ala, or Ser; Xaa at position 45 is
 Gln, Val, or Met; Xaa at position 51 is Asn or Arg;
 Xaa at position 55 is Arg, Leu, or Thr; Xaa at
 position 59 is Glu or Leu; Xaa at position 60 is Ala
 or Ser; Xaa at position 62 is Asn or Val; Xaa at
 30 position 67 is Ser, Asn, or His; Xaa at position 69 is
 Gln or Glu; Xaa at position 73 is Ala or Gly; Xaa at
 position 76 is Ser or Ala; Xaa at position 79 is Lys
 or Arg; Xaa at position 82 is Leu, Glu, or Val; Xaa at
 position 87 is Leu or Ser; Xaa at position 93 is Pro
 35 or Ser; Xaa at position 98 is His, Ile, or Thr; Xaa at
 position 101 is Asp or Ala; Xaa at position 105 is Asn

or Glu; Xaa at position 109 is Arg or Glu; Xaa at position 116 is Lys or Val; Xaa at position 120 is Asn, Gln, or His; Xaa at position 123 is Ala or Glu; with the proviso that from four to twenty-seven of the amino acids designated by Xaa are different from the corresponding amino acids of native human interleukin-3 and wherein from 1 to 14 of amino acids 1 to 14 has been deleted from the N-terminus and/or from 1 to 15 of amino acids 119 to 133 has been deleted from the C-terminus of the polypeptide; or a polypeptide having substantially the same structure and substantially the same biological activity.

62. A method according to Claim 47 of producing a mutant human interleukin-3 polypeptide comprising the steps of:

- (a) culturing a host cell containing a recombinant DNA sequence comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:160 and capable of expressing the encoded polypeptide under conditions permitting expression of the recombinant DNA; and
- (b) harvesting the polypeptide from the culture.

63. A method according to Claim 47 of producing a mutant human interleukin-3 polypeptide comprising the steps of:

- (a) culturing a host cell containing a recombinant DNA sequence comprising vector DNA and a DNA having a nucleotide sequence corresponding to SEQ ID NO:161 and capable of expressing the encoded polypeptide under

conditions permitting expression of the recombinant DNA; and

(b) harvesting the polypeptide from the culture.

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64. A host cell containing a recombinant DNA vector comprising vector DNA and a DNA sequence selected from the group consisting of:

10 a DNA having a nucleotide sequence corresponding to SEQ ID NO:160; and

a DNA having a nucleotide sequence corresponding to SEQ ID NO:161;

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and capable of expressing the encoded polypeptide.

65. A polypeptide according to Claim 27 which is:

20 Met Ala Asn Cys Ser Ile Met Ile Asp Glu Ile Ile His
His Leu
Lys Arg Pro Pro Asn Pro Leu Leu Asp Pro Asn Asn Leu
Asn Ser
Glu Asp Met Asp Ile Leu Met Glu Arg Asn Leu Arg Thr
25 Pro Asn
Leu Leu Ala Phe Val Arg Ala Val Lys His Leu Glu Asn
Ala Ser
Gly Ile Glu Ala Ile Leu Arg Asn Leu Gln Pro Cys Leu
Pro Ser
30 Ala Thr Ala Ala Pro Ser Arg His Pro Ile Ile Ile Lys
Ala Gly
Asp Trp Gln Glu Phe Arg Glu Lys Leu Thr Phe Tyr Leu
Val Thr
Leu Glu Gln Ala Gln Glu Gln Gln [SEQ ID NO:89].

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INTERLEUKIN-3 (IL-3) MULTIPLE MUTATION POLYPEPTIDES